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THE MUSEUM
OF
NATURAL HISTORY.

MAMMALIA

BY

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THE MUSEUM OF NATURAL HISTORY;

BEING A POPULAR ACCOUNT OF THE
STRUCTURE, HABITS, AND CLASSIFICATION OF THE VARIOUS DEPARTMENTS OF

THE ANIMAL KINGDOM:

Quadrupeds, Birds, Reptiles, Fishes, Shells, and Insects,

INCLUDING THE INSECTS DESTRUCTIVE TO AGRICULTURE.

BY

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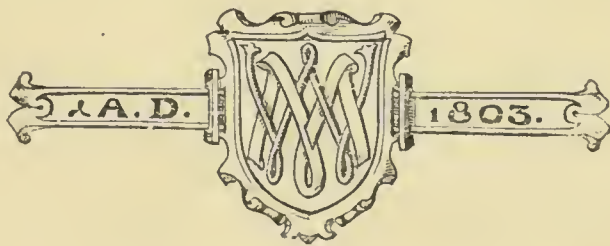
Author of *Natural History of British Entomostraca*; *Cyclopædia of the Natural Sciences*, &c.

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Author of Popular Treatises on Zoology, Insects, Crustacea, &c.

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PREFATORY ADDRESS

BY

DR. COBBOLD, F.L.S.

To those whose minds are imbued with a love of Nature as she attires herself in the ever-varying attitudes of organized existence—to those whose sympathies extend to objects placed beyond the narrow confines of their daily observation—to those who welcome truth in whatever phase she is discoverable in the physico-vital records of a past and passing world—to those who cherish glimpses of the Infinite, and would fain tear aside the “veil that separates the seen from the unseen”—to those, in short, who “look through Nature up to Nature’s God”—to such are we privileged to address ourselves!

The MUSEUM OF NATURAL HISTORY is designed—in friendly co-operation with other publications of a less scientific stamp—to promote a sound appreciation of the scope and tendency of Zoological Science, and to convey an intimate knowledge of the structure, habits, and mutual relations of different animals. There never was a time when the demand for works in all departments of Natural Science was so wide-spread as it is at the present day, consequently we find Natural History information communicated to the public through various channels. In itself, this thirst after knowledge is a refreshing symptom of healthy progress; yet, we very much doubt if any permanent advantages are derivable from the perusal of those popular curiosity books and discursive magazine sketches which daily issue from the press; because in them the ostensible aim is rather to gratify the imagination than to afford accurate and enlarged conceptions of the structural, morphological, and functional peculiarities exhibited by the multitudinous organisms which Nature unfolds to our view. Rightly pursued and understood, the sciences of Natural History yield higher claim than this. Zoology, Botany, and Geology are fit and easily accessible sciences for training the mental powers of observation, while, at the same time, if allowed to exercise their full sway, they are eminently calculated to advance our social and intellectual interests.

In the daily walks of life, whatever direction our duties may take, or whatever character they may assume, nothing is more essential than a well-regulated mind, able to observe, to store up, and to form a correct estimate of the value of facts; and the possession of an intellect of this discerning habit is of immense advantage, not only in the acquisition of knowledge, but in the formation of correct opinions. It is admitted, indeed, that in so far as the requirements of a man of narrow sympathies are concerned, a fair amount of the so-called common sense principle may be all that is absolutely necessary for his pecuniary advance-

ment; but, if we desire to obtain the higher intellectual developments of a well-regulated mind—such as the faculty of a retentive memory, a power of detecting the most subtle distinctions between one thing and another, and a thorough comprehension of our social position—we must look to the culture of our mental processes. The absence of a retentive memory is by no means indicative of original stupidity, want of industry, or lack of talent; yet, those who would become masters of this valuable product of mental discipline, can only do so by pursuing some subject, the study of which involves a methodized and continuous process of abstract reasoning. Confusion and obliviousness are often the result of indiscriminate observation, and the highest degree of cerebral activity will fail to recall facts once familiarly known, unless the storehouse of the mind has been filled in a gradual and tentative manner.

In early times, the cultivators of Natural History science confined themselves, for the most part, to the mere collection of cabinet specimens, whose individual worth was estimated by comparative beauty or singularity of form, whilst the more important facts and phenomena respecting the relation of these animal, vegetable, and mineral bodies, the one to the other, were entirely overlooked. As years rolled on, the united energies of many hard-working naturalists projected only a few thin rays of light upon the chaos of accumulated facts, until at length the genius of Linnæus and Jussieu, of Goethe and Oken, of Hunter and Ray, of Cuvier and Lamarck, eclipsed these feeble scintillations by the effulgent brightness of their giant intellects. In later times, the Natural History sciences owe their rapid progress rather to the combined investigations of the many, than to the isolated efforts of the few, so that all the various departments of Zoology, Botany, and Geology acknowledge one or more presiding heads to whom they are severally indebted for their advancement—such as Westwood in Entomology; Audubon and Gould in Ornithology; Bell and Dana in Crustaceology; Von Siebold in Helminthology; Busk and Allman in Zoophytology, and so forth. As a whole, however, Biological science has been impelled forward most significantly by those, who, in addition to their promotion of specialities, have given more or less comprehensive generalizations, as exemplified in the writings of J. Müller, Agassiz, Owen, Huxley, E. Forbes, J. D. Hooker, Lindley, Darwin and others. It is extremely difficult to estimate the combined value of independent and widely different researches, such, for example, as those of Kölliker and Leydig in Histology; of Van der Hoeven and J. E. Gray in Zoology; of Hermann Von Meyer and Leidy in Paleontology; of Brongniart and Bowerbank in Fossil Botany, &c.; and yet, if one mind could be found capable of retaining within its grasp the multitudinous facts which these and similar investigations have separately unfolded, we cannot doubt that a flood of light would be thrown upon their intermutual relations and special dependence on the objects by which they are surrounded. Notwithstanding this drawback, however, we are bold enough to state that men of science have now fairly realized the fundamental unity of plan pervading all-created nature throughout time and space. Those who look upon Botany, Zoology, and Geology as so many distinct sciences, should bear in mind that the laws regulating the facts, which these various branches of study have generally brought to light, exhibit but one grand scheme of contriv-

ance, adaptation, and design. The philosophic and truth-loving naturalist perceives that in all epochs of the world's history, in whatever condition its cosmical elements have appeared, the laws prevailing hitherto are the same as those in operation at the present day; and the singularly varied results that we now witness are regulated by the degree, direction, and conditions imposed upon those laws by the all-wise Creator, who alone is capable of ordaining or abrogating their existence.

Having thus particularized the more palpable advantages legitimately deducible from the pursuit of Natural History science in its social, practical, and intellectual bearings, we are by no means willing to halt, but, on the contrary, propose to advance yet another step, in view of enforcing a still higher claim for its consideration. Ere, therefore, we weigh anchor, and suffer our volume to brave the waves of public opinion, we invite attention to another argument, which shall serve as ballast for the outward voyage.

For Biological science, that is to say, for Natural History in the widest acceptance of the term, we claim especial consideration on the score of *morality*, and, in doing so, we can powerfully appeal to the honest convictions of one of her most favoured sons, whilst we take leave, at the same time, to add the testimony of our own less cogent experience. In the eminently philosophical address by Professor Huxley, "On Natural History, as Knowledge, Discipline, and Power," delivered in the capacity of Fullerian Professor at the Royal Institution in 1856, the argument is stated thus:—"Let those who doubt the efficacy of science as moral discipline, make the experiment of trying to come to a comprehension of the meanest worm or weed—of its structure, its habits, its relation to the great scheme of nature. It will be a most exceptional case, if the mere endeavour to give a correct outline of its form, or to describe its appearance with accuracy, do not call into exercise far more patience, perseverance, and self-denial than they have easily at command; and if they do not rise up from the attempt, in utter astonishment at the habitual laxity and inaccuracy of their mental processes, and in some dismay at the pertinacious manner in which their subjective conceptions and hasty preconceived notions interfere with their forming a truthful comprehension of objective fact. There is not one person in fifty whose habits of mind are sufficiently accurate to enable him to give a truthful description of the exterior of a rose!"

We cordially endorse these sentiments, and are perfectly satisfied that durable profit in science rests, not merely with those who have talent and opportunity to bring themselves into notice, but with those who, in addition to these absolutely necessary advantages, have learnt to discipline their minds in the moral qualities of courage, probity, and patience. Were it our intention to enlarge very fully on this topic, many illustrations of the moral effects produced by an investigation of the works of Nature might be brought forward; but, on such lofty ground, a cautious tread is necessary.

It is true that things familiarly known and understood often fail to leave their due impression on the mind; yet this evanescence is in a great measure counterbalanced in those who

court philosophy in common things. Some phenomena, too, maintain their teleologic power, in spite of the deteriorating influences of familiarity, or the materialistic tendencies—falsely so called, if rightly viewed—of developmental hypotheses. What theories, we ask, shall nullify our independent conceptions of the final cause demonstrable in an examination of the marvellous mechanism of the Camel's stomach—associated, as it is, with other co-ordinating structures in the same animal, almost equally significant? Our minds are not stultified, nor our reasonings fettered by the consideration that the stomachal compartments and their numerous water-cells are, after all, mere diverticula of the œsophagus! On the contrary, these morphological variations do but serve to indicate a uniformity of plan, harmoniously blended with the development of other tissues, objects, and circumstances by which the creature is surrounded; and, therefore, may we admit, with Lavater, that every organ is “an assemblage of incomprehensible effects,” whilst, at the same time, we recognize the fact, that each bears a strict relation to all exterior organic and inorganic phenomena manifested throughout time and space; such a persuasion, however, does not, on the other hand, weaken our respect, or even admiration, for the man whose imagination is excited by the sudden discovery of a previously unseen marvel; and whilst history has unfolded to us many curious illustrations of this kind—and a very memorable one in the case of Sir Isaac Newton—we can, nevertheless, well afford to do homage to the words of an eminent British surgeon. This distinguished man—unknown, we believe, in the religious world—on opening the paunch of a Dromedary for the first time, paused to reflect on the beautiful structure there presented to his gaze, and then, on bended knee, exclaimed in solemn phrase—“O God! how wonderful!” Such an utterance, deep and heartfelt, betokened, at all events, the moral power of the study of Comparative Anatomy; and we know of nothing in the history of differentiating specializations, as they are pedantically termed, which can in the slightest degree invalidate the force of so virtual an expression of belief in the doctrine of final causes!

On this delightful theme we enlarge no further. Brevity in the enunciation of our purpose may have failed to convey a due estimate of the scope and tendency of Natural History science; yet, if haply the appetite has been augmented, the mind imbued, the desire enlarged, and the will provoked in the direction our arguments have tended, we fear not now to invite our readers to a close acquaintance with the facts set forth in the present volume.

AN OUTLINE

OF THE

CLASSIFICATION OF MAMMALIA.

FIRST GROUP—PLACENTAL AND VIVIPAROUS MAMMALS.

- ORDER I.—BIMANA, *Hominidæ*; Man.
- ORDER II.—QUADRUMANA, { *Simiadæ*; Monkeys of the Old World, *i.e.*, Anthropoid Apes, True Apes, Monkeys Proper, and Baboons.
Cebidæ; Monkeys of the New World, or American Monkeys.
Hapalidæ; Marmozets.
Lemuridæ; True Lemurs.
Lichanotidæ; Indris.
Nycticebidæ; Loris, Galagos, Potto.
Tarsiidæ; Tarsiers.
Cheiromyidæ; Aye-aye of Madagascar.
Galeopithecidæ; Flying Lemur of Java.
- ORDER III.—CHEIROPTERA, { *Vespertilionidæ*; Pipistrelle, Noctule, Serotine, Barbastelle, Long-Eared Bat, &c.
Rhinolophidæ; Horse-shoe Bats.
Phyllostomidæ; Vampires, African Leaf Bat.
Pteropidæ; Kalong, &c.
- ORDER IV.—INSECTIVORA, { *Talpidæ*; Moles, Star-Nose, Chrysochlore.
Soricidæ; Shrew-Moles, Shrews, Musk-Rat, Elephant-Mouse, Solenodon, Bulau, &c.
Tupaiadæ; Tupaias.
Erinaceadæ; Hedgehogs, Tenrec, Sokinah.
- ORDER V.—CARNIVORA, { *Ursidæ*; Bears, Badgers, Raccoon, Ratel, Glutton, Coatimondi, &c.
Mustelidæ; Weasels, Martens, Sable, Ermine, Otters, Skunk, Teledu, Grisons, &c.
Viverridæ; Civets, Ichnemumons, Genet, Rasse, Paradoxure, Mongoose, Galet, &c.
Hyænidæ; Hyænas, Aard-Wolf.
Canidæ; Wolves and Dogs, Foxes, Jackal, Fennec, Lycaon, Lalande.
Felidæ; Cats, Leopards, Lion, Tigers, Puma, Jaguar, Cheetah, Lynx, Ounce, Serval.
- ORDER VI.—PINNIPEDIA, { *Phocidæ*; Seals, Sea-Leopard, Sea-Bear, Sea-Lion, Sea-Elephant.
Trichecidæ; Walrus.
- ORDER VII.—RODENTIA, { *Sciuridæ*; Squirrels, Marmots, Flying Squirrels, Jelerang, Assapan, Souslik.
Myoxidæ; Dormice.
Dipodidæ; Jerboas, Alak-Daargha.
Muridæ; Mice, Rats, Hamster, &c.
Arvicolidæ; Voles, Water-Rat, Lemmings, Sleppez.
Castoridæ; Beaver, Musquash, Coypu.
Hystriidæ; Poreupines, Shore-Mole, &c.
Octodontidæ; Octodon, Schizodon, Spalacopus, Habrocome, Ctenomys.
Chinchillidæ; Chinchilla, Chinch, Viscacha.
Cavidæ; Cavies, Agoutis, Capybara, Paca.
Leporidæ; Hares and Rabbits, Calling Hare, Ogotona.

- ORDER VIII.—EDENTATA, { *Manidae* ; Pangolins or Scaly Ant-eaters.
Myrmecophagidae ; True Ant-eaters, Tamandua, Aard-Vark.
Dasypidae ; Armadillos, Pichichiago.
Bradypidae ; Sloths, Unau.
- ORDER IX.—RUMINANTIA, { *Bovidae* ; Oxen, Bison, Buffaloes, Musk Ox.
Egoscridae ; Goats and Sheep, Ibex.
Antilopidae ; Gnoos, Antelopes, Eland, Harte-Beest, Bubale, Prong-horn, &c.
Camelopardidae ; Giraffe.
Cervidae ; Stags, Elk, Rein-deer, Roebuck, Muntjak, Musk-deer.
Camelidae ; Camels, Llamas.
- ORDER X.—SOLIDUNGULA, { *Equidae* ; Horses, Zebras, Quagga, Ass, Kiang.
- ORDER XI.—PACHYDERMATA, { *Elephantidae* ; Elephants.
Rhinocerotidae ; Rhinoceroses.
Hippopotamidae ; Hippopotamus.
Tapiridae ; Tapirs.
Suidae ; Boars, Wart-Hogs, Peccaries, Babyroussa.
Hyrcidae ; Dasse, Daman.
- ORDER XII.—CETACEA, { *Balenidae* ; Mysticete, Razor-back, &c.
Catodontidae ; Cachalot or Sperm Whales.
Delphinidae ; Dolphins, Porpoise, Beluga, Narwhal.
Manatidae ; Manatee, Dugong, Steller's Rhytina.

SECOND GROUP—NON-PLACENTAL AND OVO-VIVIPAROUS MAMMALS.

- ORDER XIII.—MARSUPIALIA, { *Phalaseomyidae* ; Wombat.
Macropidae ; Kangaroos, Potoroo, Tree-Kangaroos.
Phalangistidae ; Phalangiers, Vulpine Opossum, Flying Phalangiers, Koala.
Peramelidae ; Bandicoot Rats.
Dasyuridae ; Ursine Opossum, Phascogales, Banded Myrmecobee, Thylacine.
Didelphidae ; American Opossums, Yapock.
- ORDER XIV.—MONOTREMATA, { *Ornithorhynchidae* ; Duck-bill.
Tachyglossidae ; Porcupine Ant-eaters.



Order - Troglodytes. Simia. Nasalis.

Order. Quadrumana.

Family. Simiidae.



Larvatus. Proboscis Monkey.

Math. J. Holmes. Doon.



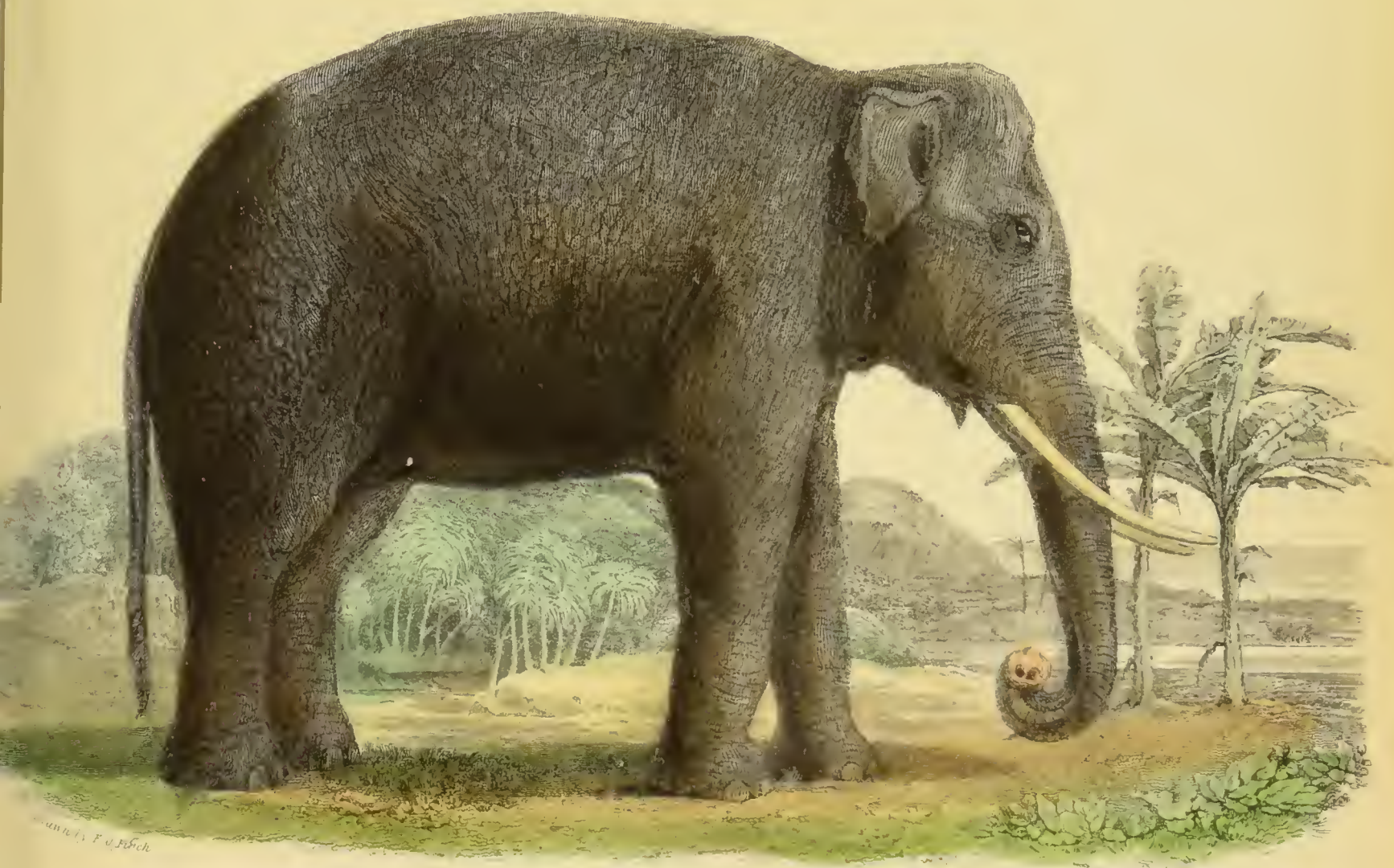
Troglodytes. Gorilla. Gorilla.



Simia. Satyrus. Orangutan.

.A.W. Lowry. Sculp.

THE
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E. Indicus. Indian Elephant.

WILLIAM MACKENZIE.
LONDON, GLASGOW, & EDINBURGH.

MAMMALIA.

Order, Quadrumana.

Genera, Papio, Mycetes, Ateles, Cebus.

Families Simiidae
Cebidae



M. Seniculus Red Howler.



P. Mormon, Mandrill



A. Pampus Coati



C. Latellus, Horned Monkey

Order: Quadrumana.

Genera: Calithrix, Jacchus, Lemur, Indris

Families: Cebidae
Hapalidae
Lemuridae



8

Cal. Scureus, Squirrel Monkey



9

J. Vulgaris, Common Marmoset



11

L. Catta, Ring tailed Maceuco



12

J. Brevicaudatus, Indri



10

J. Rosalia, Marikma

Genera, Loris. Galago. Tarsius. Galeopithecus

Order, Quadrumana.

Families {
Nycticebidæ.
Tarsiidæ.
Galeopithecidæ.



Lor. Gracilis Bengal Loris.



Galago Senegalensis. Senegal Galago.



T. Spectrum. — Tarsier.



Galeopithecus Volans. Flying Lemur.

Lemur group



P. Spectum Vespertilion Bat



Ptero Pseudob. Kulong Bat



M. Velox Bulldog Bat

Order Insectivora

Genera Erinaceus, Sorex, Talpa.

Families { Erinaceidæ
Soricidæ
Talpidæ

22



T. Europaea. Common Mole.

20



E. Europaeus. Common Hedgehog.

21



S. Araneus Common shrew.

Order Carnivora

Genera. Canis

Family Canidæ

23



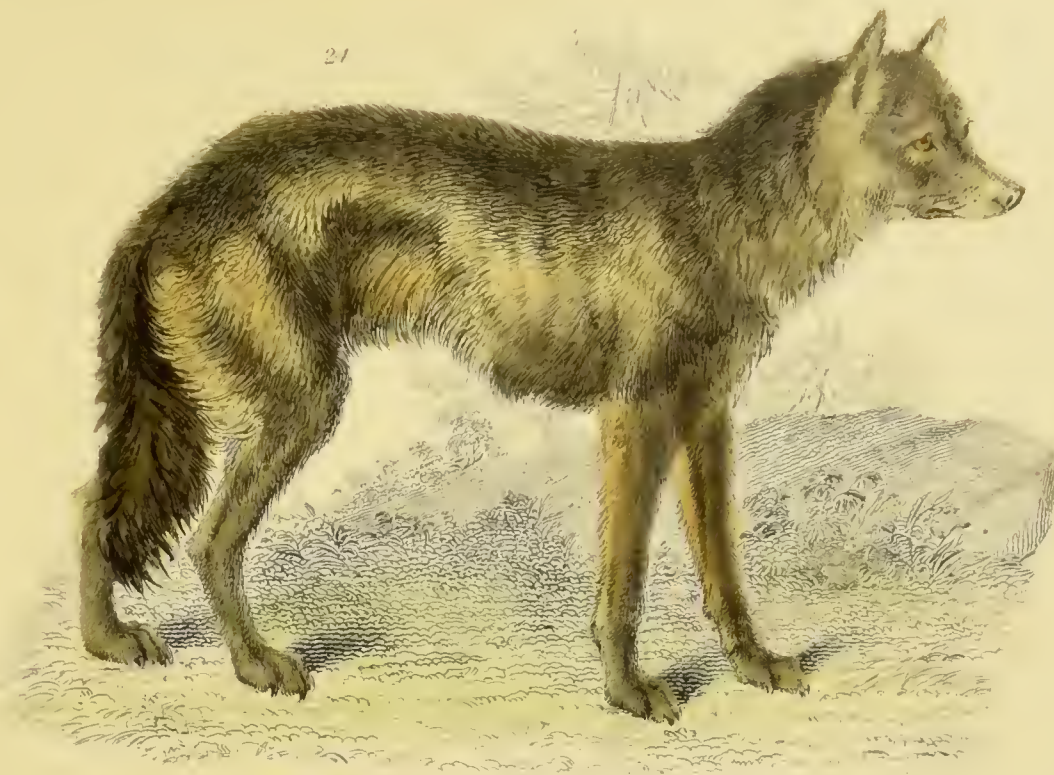
C. Familiaris. Tibetan Dog

MAMMALIA.

Genera Canis Megalotis Vulpes

Order Carnivora

Family Canidae



C. lupus Wolf



M. Zorba Fox



V. Vulgaris Fox

Order Carnivora

Genera. Canis Felis

Families. Canidae
Felidae



C. aureus Jackal



F. leo Lion



F. tigris Tiger

Order Carnivora

Genera Hyena Viverra Herpestes

Families Hyenidae
Viverridae



H. Striata Striped Hyena.



V. Civetta Civet



H. Ichneumon Egyptian Ichneumon.

Order Carnivora

Family Mustelidae

Genera Mephitis Martus, Lutra



Meph^s varians, Skunk.



Mart^s Foina, Pine Martin.



L. Vulgaris, Common Otter

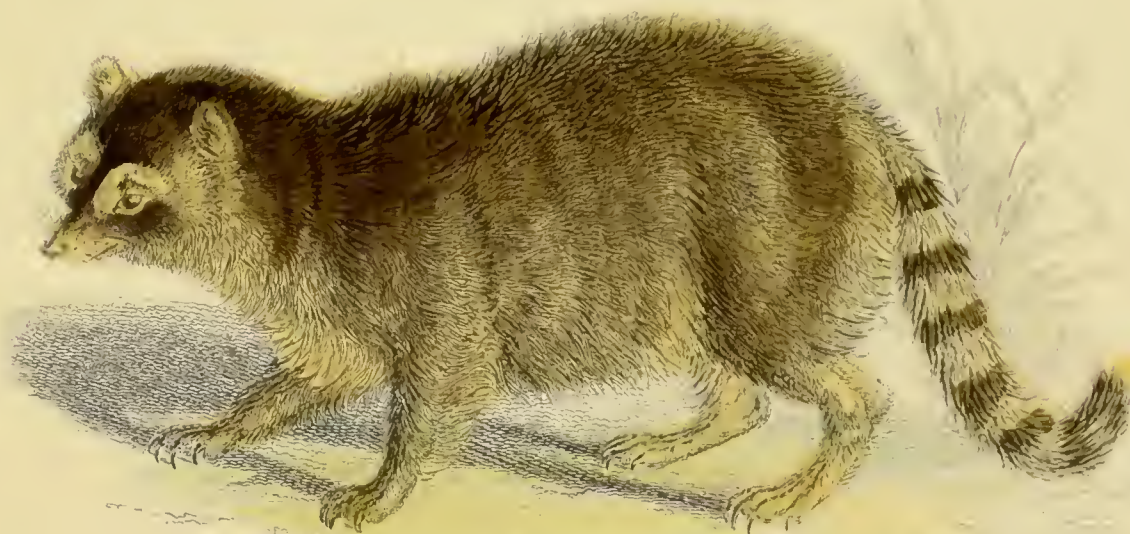
Order: Carnivora

Genera: Gulo, Procyon, Nasua.

Families: { Ursidae
{ Mustelidae



G. Luscus *Wolverine*.



P. lotor *Raccoon*



P. fuscus *Brown* *Coati Mundi*

Thos. Landsdown delin.

MAMMALIA.

Order Carnivora

Genus Ursus

Family Ursidae



U. Maritimus. Polar Bear

Order Pinnipedia

Genus Phoca

Family Phocidae



P. Vitulina. Common Seal

Order. Pinnipedia

Genera. *Trichechus*. *Arctocephalus*.

Families. *Phocidae*.
Trichechidae.

11



A. Ursinus Sea Bear

24

12



T. Rosmarus Arctic Walrus
or Morse

Order Rodentia

Genera Sciuropterus, Arctomys, Dipus, Helaniys.

Families { Sciuridae
Dipodidae



Sciuropterus. Greater Flying Squirrel



Marmotta. Alpine Marmot



Helicapsus. Cape Jerboa



Dipus. Egyptian Jerboa

Order Rodentia

Myomys Mus Lemmus Castor

Myomys
Muridae
(Castoridae)

47



Myomys keltianus — Dormouse

48



Mus Rattus — Brown Rat

49



Myomys Lemmus — Lemming

50



Castor Fiber — Common Beaver

Order Rodentia

Genera Myopotamus, Hystrix, Lepus, Lagomys.

Families Castorida
Hystriidae
Leporidae



Lep. Timidus — Common Hare



Lep. Pusillus — Small Hare



Myopot. coypu — Coypu



H. cristata — Common Porcupine

MAMMALIA.

Genera Bradypus Dasypus Myrmecophaga Manis

(Bradypodidæ
Dasypodidæ
Myrmecophagidæ)



B. Tridactylus Three-toed Sloth



D. Peba . *Peba*

56



Myr. Subata . *Great Ant-eater*



M. Tetradaactyla Long-tailed Manis.

Ch. P. W. D.

Order Ruminantia

Genera Bovus Ovis

James Boydell



B. Americanus. American Bison



O. Ammon. Thibet Sheep



O. Montanus. Mountain Sheep

MAMMALIA.

Order Ruminantia

Family Bovidae

Genera Capra Catoblepas Cephalolophus Antelope



Capra pumilus
Gnu Antelope

Capra capra Common Kudu

Order Ruminantia

Genera Oryx, Potax.

Family Bovidae

66



O. leucoryx — *leucoryx*

67



P. picta — *Nul Ghum*

Order, Ruminantia .

Genera Capræolus Alces

Family Cervidæ



Cap^s Capræa — Roebuck .



A Palmatus — Elk or Moose Deer

Chas. Landseer delin.

W. Leitch sculp

Genera Rangifer Camelopardalis

Order. Ruminantia

Families {Cervidæ
{Camelopardidæ.

72



R. Tarandus. — Reindeer.

73



Cam. Giraffa. — Camelopard.

Genera Camelus, Auchema, Tragulus

Order Ruminantia

Families } Camelidae
 } Moschidae

74



C. Dromedarius Dromedary

75



A. chama Chama

76



T. acutus acutus Deer

Genus Equus

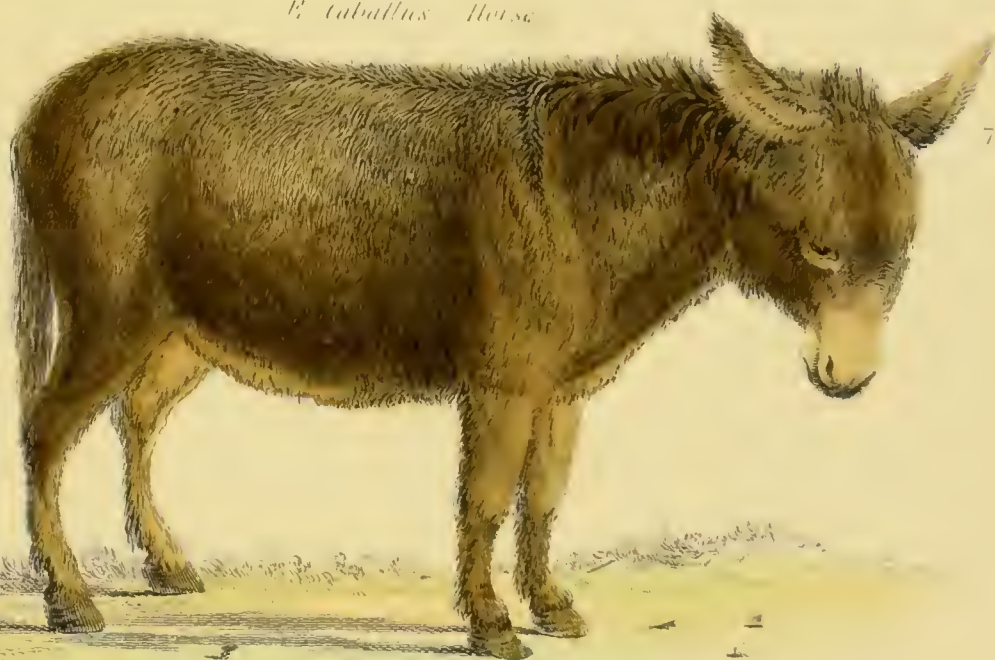
Order Solingula

Family Equidae



77

E. caballus Horse



78

E. asinus Ass



79

E. Zebra Zebra

80



Rhinocerus unicornis. Indian Rhinoceros

81



Hippopotamus amphibius. Hippopotamus

82



Tapirus American Elk

Order Cetacea

Genera Manatus Halicore Rhytina

Families { Manatidae
Rhytinae



M. Australis — American Manatee



H. Dugong — Dugong



R. Stelleri — Steller's Rhytina

Families { Dephniidae
Polyseridae

*M. Monnier* — *Journal*

Order Cetacea

Genus Delphinus, Balena

Emulidae
Delphinidae
Balenidae



D. Delphis - Dolphin



B. Mysticetus - Common Greenland Whale

MAIOMALIA

Order Marsupialia

Genera Hypsiprymnus Macropus & Phascogomys

Families (Macropodidae
(Phascogomidae



Hyp. minor Potoroo or Kangaroo Rat



M. giganteus Great Kangaroo



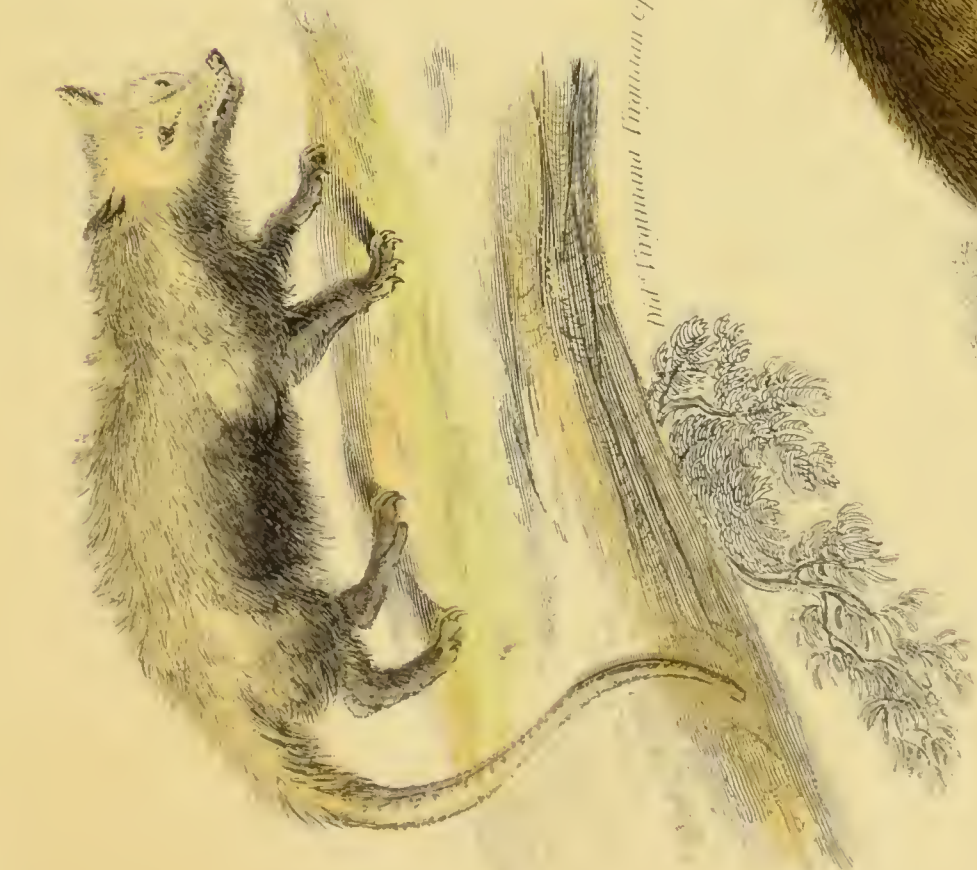
U. ursinus Wombai

MAMMALIA

Genus. Phalangista. Peromyscus Didelphus

Order. Marsupialia

Families
Phalangistidae
Peromyscidae
Didelphidae



96

Did. Vampiroide Vampiroide egypticus



94

Phal. (Didelphid). Meseleke Phalangista



95

Pl. (Peromyscus) Spang. Bandicoot

Order. Marsupialia

PL. III. MAMMALIA. A. Didelphid. B. Phalangista. C. Peromyscus. D. Marsupialia. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.

MAMMALIA.

Order Marsupialia

Family Dasyuridae

Genera - Dasyurus.



Order Monotremata

Genera Echidna, Platypus

Families Echimidae
Ornithorhynchidae



E. Hystrix, Porcupine Ant-eater



P. Anatinus Duck-billed Platypus

Order Cetacea

Genus Balaena

Family Balænidæ

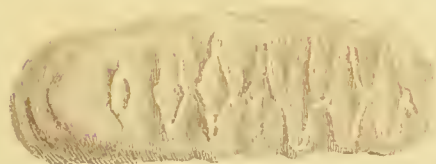


B. Manatee. (C. 2000. 1800. 1800. 1800.)

Order Pachydermata

Genus Mastodon

101

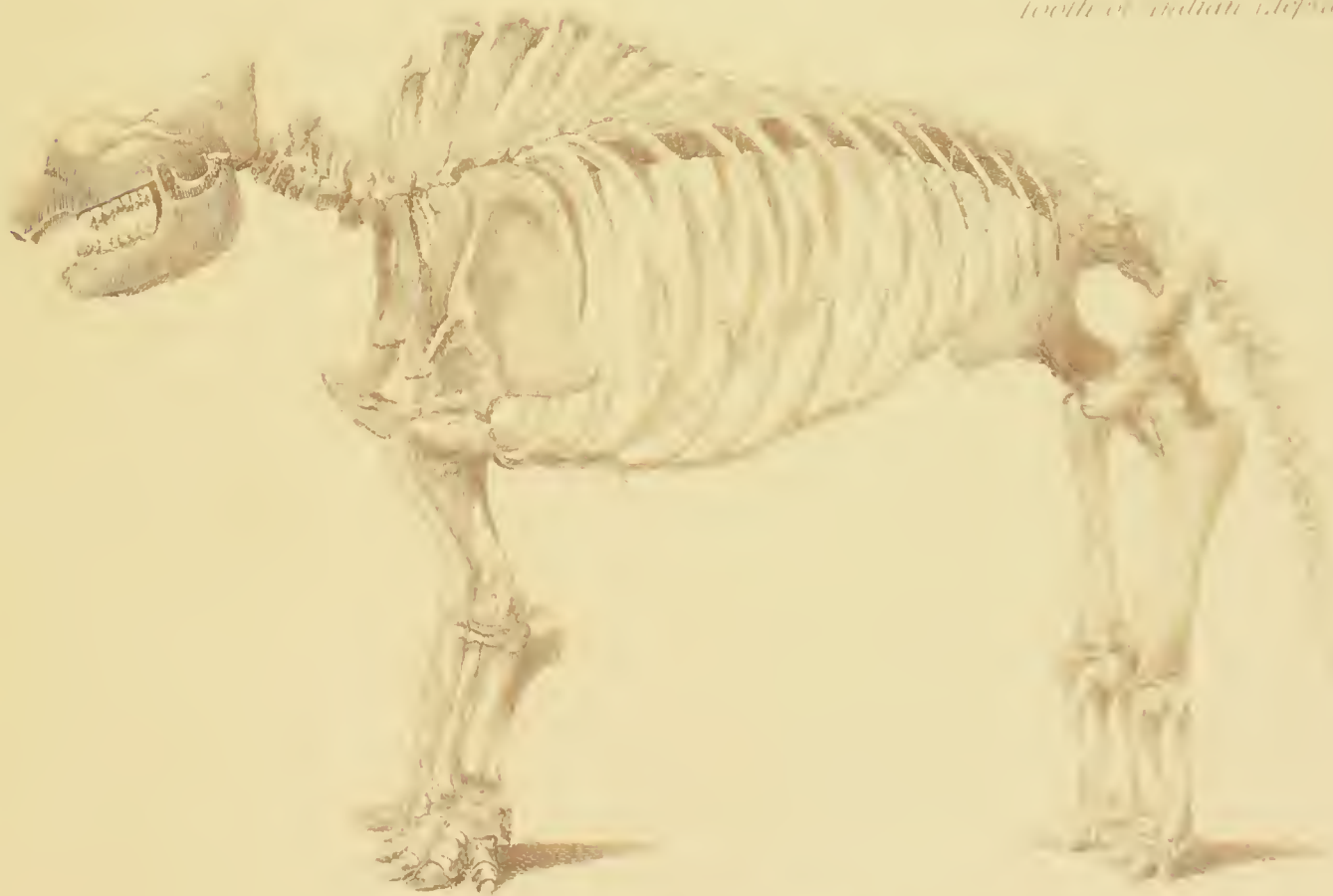


Tooth of African Elephant.

102



Tooth of Indian Elephant.



M. Giganteus. (C. 2000. 1800. 1800. 1800.)

SKELETON OF BEASTS



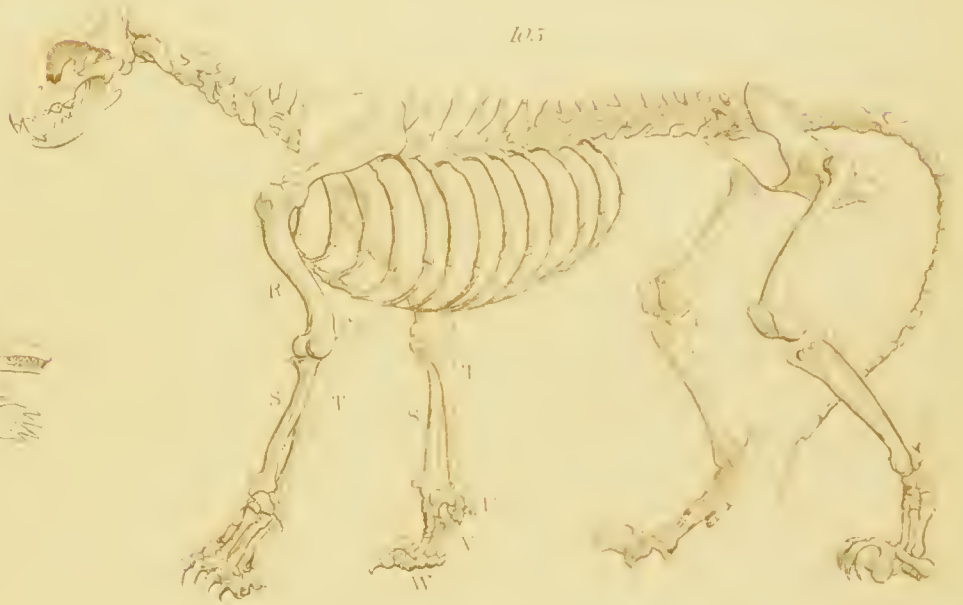
102

Onos arctos Sheep



106

Mus rattus Black Rat



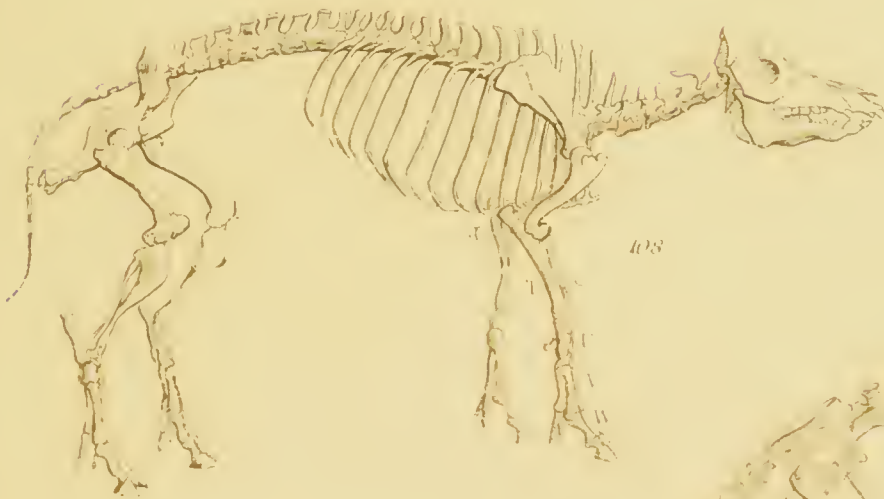
105

Felis leo Lion



104

Talpa europaea Mole



108

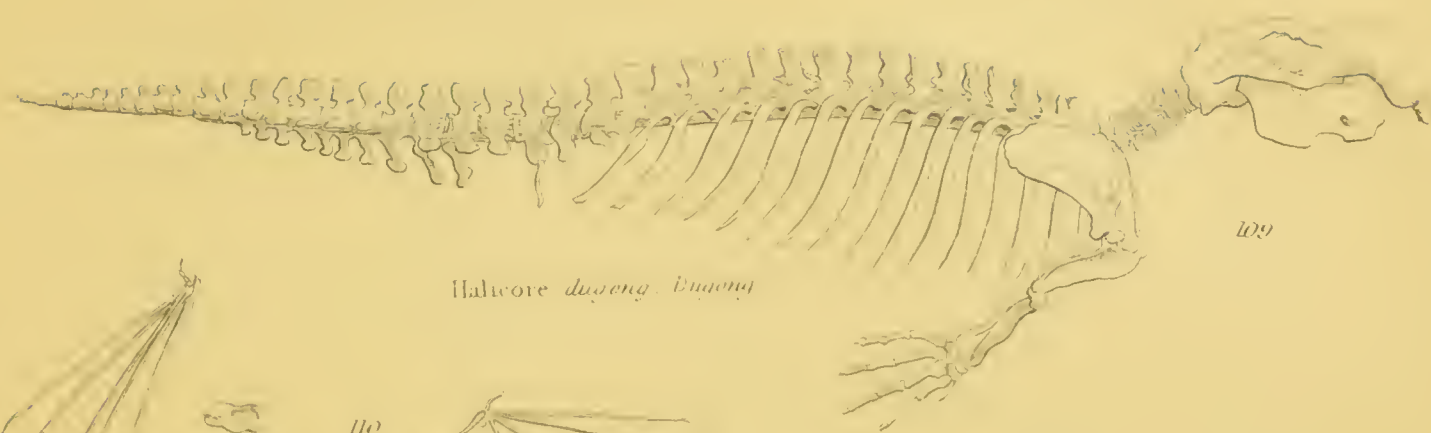
Sus scrofa Hog



107

Myrmecophaga jubata Great Ant-eater

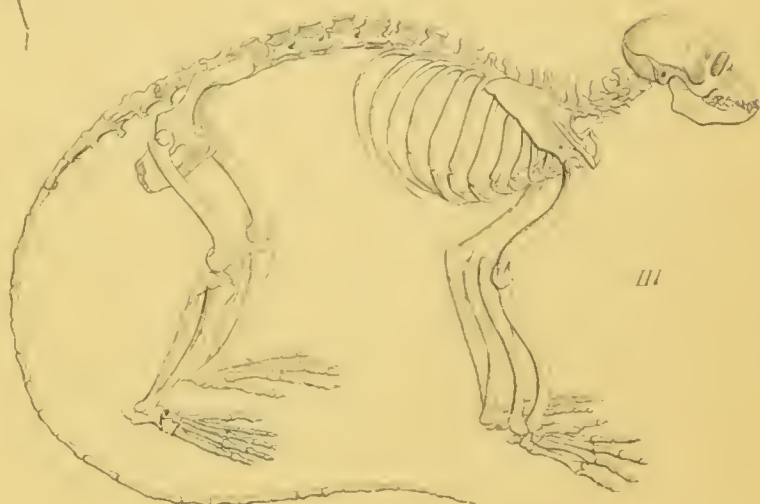
SKELTON OF BEASTS

Halcore *duong*. *Duong*

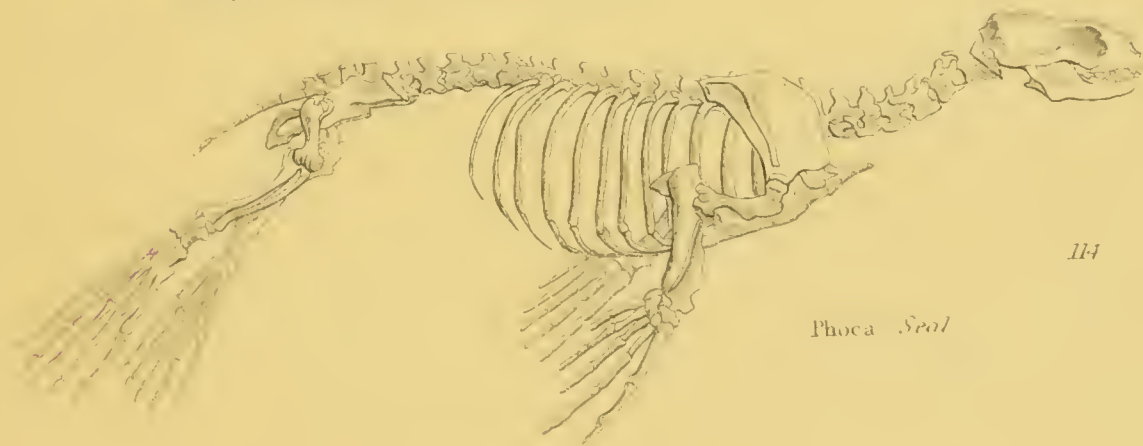
Vespertilio. Bat



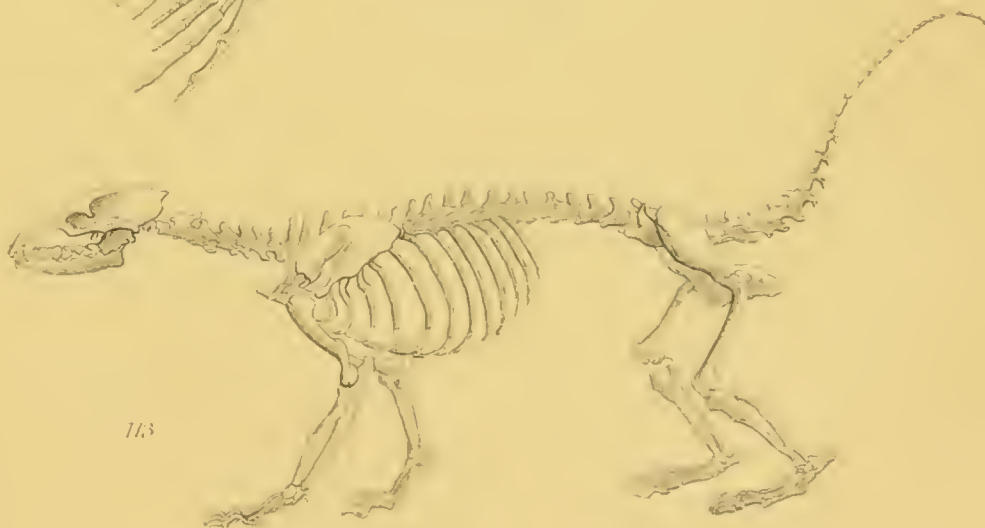
Bradypus tridactylus. Three toed Sloth



Semnopithecus maurus *Lotong*



Phoca Seal



Nasua nasua *cont. mond.*

THE MUSEUM OF NATURAL HISTORY. ZOOLOGY.

VERTEBRATE ANIMALS—(VERTEBRATA.)

WHEN the immortal Cuvier published his new arrangement of the Animal Kingdom, he divided all animals into four principal sections, which we still find adopted, with some modifications, by most naturalists. The changes which have been made in the contents of these great divisions, in accordance with the progress of zoological science since the death of the great French comparative anatomist, have principally affected the three lower groups established by him, and the limits of his first and highest division of animals, that of the Vertebrata, have remained without alteration. This, indeed, is no more than might have been expected. The vertebrate animals are those whose existence has always, from various circumstances, been pressed most forcibly upon the notice of mankind. Vertebrate animals furnish the greater part of our daily food, and amongst them are to be found our most dangerous enemies, so that the mere instinct of self-preservation must have early led even the uncivilized man almost unconsciously to the study of their natural history. Hence, the knowledge of the differences and agreements in the structure of these creatures had made great progress, even in the popular mind, at a period when the greatest philosophers knew little of the remainder of the animal kingdom; and Linnæus, in dividing the whole of animated nature into six classes, gave no fewer than four to the creatures which we now distinguish as Vertebrata.

The name of *Vertebrata* or *Vertebrate animals*, given to this great section of the Animal Kingdom, has reference to one of its principal characters, namely, the possession of a backbone (spine or *vertebral column*), composed of numerous joints (*vertebræ*) attached firmly to each other, but in such a way as, in most cases, to insure more or less flexibility.

The office of this bony column is twofold. In the first place, by its enlargement into the hollow case called the *skull*, and by the presence of apertures in each of its joints, which, when placed in their proper position, form a continuous tube or canal running down the back of the animal—it furnishes a protection for the brain and spinal marrow (spinal cord), the

great centre of the nervous system, which in these creatures attains a high degree of development. In the second place, by affording support to numerous other bones, varying in form and arrangement according to the duties they have to perform, it constitutes the centre of the skeleton of these animals—a sort of bony framework which at the same time serves to protect the more important internal organs, and to furnish solid points of attachment for the muscles by which the movements of the various parts are effected.

This framework of bones consists, in addition to the skull and spinal column already referred to, of the ribs, and of the bones of the limbs—the former, as is well known, constituting a series of long curved bones which inclose the cavity of the chest, and are for the most part movably articulated to the vertebræ on each side. The opposite extremities of the ribs are also usually united to a single bone, which occupies the centre of the anterior or inferior surface of the chest, called the breastbone (or *sternum*); and in most air-breathing Vertebrata the whole framework of the chest is capable of moving by the action of the muscles attached to the ribs, in such a manner as to increase or diminish the size of the cavity inclosed by them, thus causing the lungs to be alternately filled with and emptied of the air necessary for respiration. The vertebræ which bear the ribs are usually distinguished by several peculiarities of construction from those of the other parts of the spinal column; they are called *dorsal vertebræ*, or vertebræ of the back; those in front of them, forming the neck, are called *cervical vertebræ*, and those behind them, which are usually of great size, are called *lumbar vertebræ*, or vertebræ of the loins. The latter are followed by the vertebræ which support the hinder extremities; and these again, in most of these animals, by a number of vertebræ, gradually diminishing in size and completeness, which form the tail. These are the *caudal vertebræ*.

Of limbs in the Vertebrata there are never more than two pairs. The anterior limbs are usually attached to the body by being articulated to a pair of flat bones

called the shoulder-blades, which lie upon the ribs, and are kept in their proper position partly by the action of powerful muscles, and partly by the support afforded them by one or two pairs of bones which spring from the front of the breast-bone; these bones are often wanting. The hinder extremities, on the contrary, are usually articulated to a strong bony ring or basin (the *pelvis*) which is firmly attached to the vertebral column below the loins; the vertebræ of this part of the spine being also completely united to each other, so as to form a single bony piece (the *sacrum*).

In the essential structure of the limbs there is a wonderful uniformity throughout the whole of this great group of animals. Each limb consists of four distinct parts, which correspond exactly in the anterior and hinder extremities, although, in conformity with the usages of human anatomists, they have received different names in the two pairs. In the fore-limb the bones are the arm-bone, the two bones of the fore-arm, the bones of the wrist, and those of the hand; in the hind-limb they are the thigh-bone, the two bones of the shank, the heel-bones, and those of the foot. The arm-bone and thigh-bone (*humerus* and *femur*) articulate respectively with the shoulder-blade and pelvis; they are single bones, usually of a cylindrical form. The fore-arm and the shank include two parallel bones (called the *ulna* and *radius* in the arm, the *tibia* and *fibula* in the leg), one of which, in each member (the *ulna* and the *tibia*), is united by a hinge-like joint with the lower extremity of the arm or thigh-bone, forming the elbow or the knee. The other bones (*radius* and *fibula*) are scarcely, if at all, attached at this joint; they are consequently capable of rotating to a certain extent, and thus enable the hand or foot to be turned in various directions. It is to the broad extremity of these latter bones that those of the wrist and heel (*carpal* and *tarsal bones*) are attached; these are numerous short bones, packed closely together, but still capable of a greater or less freedom of motion. They are followed by the bones of the hand and foot (*metacarpal*, *metatarsal*, and *digital bones*), which frequently form five rays of three or four joints in each, starting from the wrist or heel. Of these the metacarpal and the metatarsal bones constitute the palm of the hand and the sole of the foot in man; the digital bones, which are also called *phalanges*, form the fingers and toes.

It is not to be supposed, however, that all these parts present themselves to our notice with equal distinctness in every creature formed upon what is called by naturalists the vertebrate type; in fact, we meet with an almost endless variety of modifications in the different regions of the body, but especially in the limbs; and the study of these modifications, of the wonderful series of changes, by which the Creator of all things, submitting himself, as it were, to a self-imposed law, has adapted the same general type of structure to the most dissimilar purposes, is not only one of the most interesting branches of zoology, but also one of the most striking proofs furnished by natural theology of the prevalence of an intelligent design in Animated Nature.

It is the business of the philosophical anatomist to investigate these marvellous modifications of structure; to trace the plan by which the same organs have been adapted to the most different offices, and to endeavour, by deducing therefrom the abstract or ideal form from which all the special structures presented to our observation may be derived by variations in the degree of development of the different parts, to obtain a type with which things, apparently the most dissimilar, may be compared: and thus to enter, as it were, into the mind of the great Designer of the universe. It is, however, unnecessary here to dwell at any length upon this most interesting branch of science, and we shall therefore content ourselves with giving a very brief abstract of the general results which have been obtained by much earnest thought on the part of some of the greatest minds of the present century.

According to the generally received views, the skeleton of a vertebrate animal is composed of numerous segments or vertebræ (the latter term being used in an ideal sense). Even the skull itself is proved to consist of several vertebræ developed in a remarkable manner—the bones of the face holding the same relation to those of the true skull, that the ribs do to the superior arch of the dorsal vertebræ through which the spinal cord passes. The four limbs are appendages of two particular vertebral segments; and similar appendages are met with in a rudimentary form upon other segments in some animals.

Regarding the skeleton in accordance with these views, as consisting ideally of a series of similar segments, we find that it is by the suppression of certain parts of some of these, and the greater or less development of others, that the varied forms of vertebrate animals are produced. The appendages constituting the limbs are, as already stated, usually suppressed completely in all but two segments, and the ribs often share the same fate in the neck, loins, and tail. In other cases the bones of one or both pairs of limbs are wanting, and in some of the lowest forms we find nothing left but the vertebral column itself, which sometimes is not even ossified, but consists of a gelatinous or cartilaginous cord, running, with little or no trace of any division into vertebræ, from the head to the extremity of the tail.

Yet throughout all these variations the intelligent observer traces one uniform plan: the great centre of the nervous system always consists of a brain and spinal cord, supported in all but one instance, by a structure which may be recognized as a vertebral column; the jaws are always supported by bones or cartilage beneath the skull, and their opening is always horizontal; the limbs are never more than four in number; the heart is always muscular, and connected with a distinct system of vessels, through which courses a blood, coloured red by innumerable globules; and the organs of the four special senses (sight, hearing, smell, and taste) are almost always highly developed, and invariably placed in cavities of the face and head. The viscera are very similar in their nature throughout the entire group, and the animals are always male or female, never hermaphrodite.

CLASS I.—MAMMALIA.

IN whatever light we consider the general arrangement of the animal kingdom, the Mammalia must always occupy the highest place in the system. Both in complexity of organization and in general intelligence, the members of this class, which even includes our own species, bear the palm from all other animals; and, if we descend to purely utilitarian views, it is amongst the ranks of the Mammalia that we must seek for all the most valuable of those creatures which have been in every age most serviceable to the human race, and have contributed most importantly to the progress of civilization. The noble and generous horse, who lends his back to the burden and his neck to the yoke with equal readiness; the brave and faithful dog, the constant friend and companion of man in all countries, and his firm ally in the subjugation of other animals; the camel, the far-famed "ship of the desert," without whose patient endurance and great strength the vast sandy plains of Africa and the desert steppes of central Asia, would have presented a more serious obstacle than even the ocean itself to the intercourse of the eastern nations; the cattle and sheep which constitute the riches of pastoral tribes, and without which an advanced civilization would be almost an impossibility: these are only a few of the important species of the class Mammalia, which have been in all times subjected to the dominion of man. We may seek in vain in any other class of animals for even a single species that may be compared with one of these.

Notwithstanding the great importance of the Mammalia, however, we have no English word to express the whole class, although the great majority of them may come under the denomination of *beasts*. The term *quadrupeds*, which also applies to the majority, is likewise inadmissible, both because it is equally applicable to many reptiles, and because some true Mammalia are not furnished with four feet. We are therefore reduced to the employment of the term *mammals*, to express the animals now under consideration in a general sense; as this term, derived from the Latin word *mamma*, a breast or teat, expresses the leading peculiarity by which these creatures are distinguished from all other animals—namely, that of nourishing their young, which are born alive, by means of a secretion produced by certain glands placed on the chest or abdomen of the mother.*

Independently of the physiological characters derived from the viviparous reproduction and the provision of milk for the nourishment of the young, which prevail in all the animals of this class, we find in other points of their structure an abundance of peculiarities by

which they may readily be distinguished from the rest of the Vertebrata. They all breathe air by means of lungs, consisting of a minutely cellular structure, suspended freely in the cavity of the chest, and unconnected with any air-tubes or sacs penetrating the other organs of the body, as in Birds. The chest is separated from the abdominal cavity by a muscular and tendinous partition called the *diaphragm*, the movement of which, by enlarging the cavity of the chest, is one principal cause of the inspiration of air. The heart contains four cavities, two ventricles for the propulsion of the blood through the arteries, and two auricles for its reception from the veins; this character is common to the Mammalia and Birds. The mouth is closed by fleshy lips, which are almost always movable; and the skin, with but few exceptions, is more or less covered with hair.

The structure of the skeleton also furnishes most important characters in this, as in other classes of vertebrata. The bones are, for the most part, destitute of air-cells, and where these exist, they do not communicate with the lungs. Most of the bones are solid, and those which possess cavities (such as the thigh-bones and arm-bones) have them filled with a peculiar fatty substance, well known as marrow. Air cavities in the bones are usually confined to the head, where they are commonly known as *sinuses*; these attain a great development in the ruminating quadrupeds, such as the sheep and deer, and in the elephant the great size of the skull is mainly due to the large air-cells which separate the two faces of the cranial bones.

The body of a mammal is usually divided into three portions—the head, neck, and trunk; and these are, in most cases, clearly distinguishable even in the living animal. In the skeleton, as will be seen by a glance at plates 32, 33, 34, they are still more strongly marked, and we find that in this we may again divide the bones of the trunk into several distinct systems—namely, the dorsal vertebræ, with the ribs; the lumbar vertebræ, forming the loins; and the sacrum, bearing the supporting arch of the hinder extremities; beyond which the vertebral column is usually continued into a gradually decreasing series of vertebræ, forming the tail.

The skull, including all the bones of the head, presents the following leading characters in mammals:—The cranium, or true skull, containing the cavity for the reception of the brain, is of larger comparative size in these than in any other Vertebrata; its bones are immovably connected with each other, and with those of the upper jaw and face, a character which is peculiar to these animals. The occipital bone, which forms the base of the skull, and is perforated by the large aperture for the passage of the spinal cord, bears a pair of articulating tubercles by which the skull is attached to the first vertebra of the neck. The upper jaw is formed by two maxillary and two intermaxillary bones, which bear teeth in a single row along their

* The Germans have the expressive term *Säugethiere*, or sucking animals, for this class. The term *Mammifères*, or teat-bearers, is in ordinary use amongst French writers, and of course refers to the same character as the term *Mammalia* here adopted. The name *Pilifères*, applied to the class by De Blainville, in allusion to the hairy covering of most of the species, has never been much made use of.

margins. The two halves of the lower jaw consist each of a single bone; they are united in front either by a cartilage or by a suture, or sometimes, as in man, the two sides of the jaw are completely amalgamated so as to form one bony piece. The lower jaw in the Mammalia is articulated directly to the skull, without the intervention of any other movable bone.

The jaws, as already intimated, are furnished with teeth, and these exhibit a great diversity in their form and structure. They are always implanted in sockets of the jaws, and these are lined by a delicate membrane, so that the teeth are never ankylosed or completely united to the bone of the jaws. The teeth consist of a hard substance called *dentine*, defended by a coating of *enamel*, and covered by a layer of a third substance called *cement*. The latter is very thin on the crown or exposed portion of the tooth in man and many animals, which have teeth similar to those of the human species; but in the teeth of many herbivorous mammals the cement acquires a great development, and vertical folds of this substance and enamel penetrate the dentine of the crown, thus giving rise, as the teeth are worn away, to an uneven surface eminently adapted to the comminution of tough vegetable matters.

A few species are entirely destitute of teeth; in others a few of the teeth are wanting, or some of them undergo peculiar modifications to adapt them to particular purposes. But in the majority we find four different sets of teeth called respectively the *incisors*, or cutting teeth; the *canines*; the *premolars*, or false molars; and the *molars*, or grinders. The incisors or cutting teeth are inserted in the intermaxillary bones in the upper jaw, and occupy the corresponding place in the lower one. Their number varies from two to ten, and their form is also subject to much diversity; but they are usually flattened transversely, so as to form a cutting edge across the front of each jaw.

The canines, so called from their large size in the dog, are also very large in all carnivorous mammals. In the human subject the upper ones are frequently called eye-teeth, from their being placed directly beneath the eyes. Of the canines we find one on each side in each jaw; the upper ones are inserted at the anterior angles of the maxillary bones, and the lower ones in a corresponding position in the lower jaw. When most largely developed, they form long, curved, conical, acute teeth, capable of inflicting the most serious wounds.

The premolars, which are usually three or four in number on each side, are generally separated by a short interval from the canines, which they frequently resemble in having only a single root; their crown is usually broad and tubercular or ridged, in a manner more or less resembling that of the true molars. The latter, of which there are also commonly three or four on each side, are the largest and strongest of all the teeth, and are implanted in the jaws by two or more roots, a character peculiar to the Mammalia, and one which is often of the greatest importance to the palæontologist in determining the nature of those fossil remains by which a certain light has been thrown upon the former history of our planet. The molars, of all the teeth, are those which appear to undergo the

greatest amount of modification to fit them to the habits and food of the animals. In the carnivorous forms we find them furnished with sharp cutting edges, and fitting together like the blades of a pair of scissors; in those which prey principally upon insects, whose hard and slippery armour renders them rather difficult to be disposed of, the molars are furnished with a double row of sharp points, from which even the hardest beetle could not find it easy to escape; in those which, like the monkeys and our own species, feed upon fruits or upon a mixed diet of soft animal and vegetable substances, the crowns of the molars are of a more or less cubical form, with the surface divided into several blunt tubercles by furrows which traverse it in different directions; and lastly, the strictly herbivorous species usually present an intermixture or alternation of the three substances of which the teeth are composed, such as produces a series of ridges upon their surface, as they are gradually worn down during the trituration of the food.

The teeth are produced from a pulpy germ or matrix contained within the jaw, and in the majority of the Mammalia the activity of this germ continues after it has served for the formation of the series of teeth first produced. These, which are commonly known as the *milk-teeth*, are shed at a certain period of life, when their places are taken by new teeth adapted to the increased size of the jaw. The milk-teeth include the incisors, the canines, and three or four molars on each side; the two former groups are replaced by new incisors and canines; the deciduous molars are shed to make room for the premolars, whilst the true molars are produced later than the other teeth, and are never changed. The teeth of the Mammalia are never shed more than once; but, in some forms, the formative pulps of some of the permanent teeth continue in activity during the whole life of the animals, and thus the teeth are constantly growing at the root. As these modifications of the teeth are usually characteristic of certain orders of Mammalia, they will be more particularly referred to hereafter, when the beautiful adaptation of their structure to the habits of the animals will be more clearly seen.

The general structure of the skeleton will not detain us long, as it nearly agrees with that already described (pp. 1, 2), as the most perfect development of the vertebrate type. The vertebral column, or back-bone, as it is usually termed, is divided into several regions, as has been already stated: these are called the *cervical*, *dorsal*, *lumbar*, and *saeral* regions, or the regions of the neck, back, loins, and sacrum; and the continuation of the vertebral column into the tail, when this exists, constitutes the *caudal* region. The same names are applied to the vertebræ composing each region.

Of the cervical vertebræ there are almost invariably seven; and this is the only region of the body in which the number of vertebræ is at all constant.* Whatever may be the length of the neck in these animals, the number of the vertebræ is the same; the short neck

* The only exceptions to this rule are presented by the Sloths, in which the neck contains eight or nine vertebræ; and by the Southern Manatee (*Manatus australis*), which usually has only six cervical vertebræ.

of the human subject, and the enormously long one of the giraffe, each contain seven vertebræ, although the one constitutes only one-seventh and the other three-sevenths of the entire vertebral column. In the whales the vertebræ of this region of the body are completely united together, to form a single bone. Except in the sloths, all the cervical vertebræ are destitute of ribs, and the spinous processes gradually increase in height as we recede from the head. The first two vertebræ, however, in the Mammalia, present peculiarities of structure which have obtained them distinct names in all systems of anatomy. The first, called the *atlas*, forms a bony ring, bearing on its upper surface a pair of cuplike depressions for the reception of the prominent condyles or articulating tubercles of the base of the skull (see p. 3); by means of this articulation the head is enabled to move up and down. The second vertebra is called the *axis*, from its possessing a peculiar process which projects forward into the ring of the first, and articulates with a flat surface on the inside of its anterior part. By this arrangement the rotatory movement of the head is effected.

The dorsal vertebræ are usually thirteen in number; but this general rule is liable to many exceptions. The foremost dorsal vertebræ usually have their upper spinous processes greatly developed, especially in animals possessing long necks or heavy heads; these processes and those of the posterior cervical vertebræ give attachment to a strong ligament (the *nuchal* ligament), which powerfully aids in supporting the head, and in some animals is continued backward as far as the loins. The dorsal vertebræ are distinguished from the rest by their bearing the articulating surfaces for the ribs, which are confined to this region of the body. The ribs are long, usually slender, curved bones, which articulate by their heads with the bodies of two vertebræ, and are nearly always supported by a tubercle against the transverse processes of the hinder of these. The anterior or true ribs are united by cartilaginous pieces with the sternum or breast-bone, which occupies the centre of the anterior or lower part of the chest. Behind these are some shorter ribs, commonly known as false or floating ribs, which are never united directly with the sternum, but only by the intermediation of a common cartilaginous band.

Of the lumbar vertebræ there are usually six or seven, but the number varies from two to nine. They are usually larger in the body than the dorsal vertebræ, and the lateral processes are often greatly developed; they are distinguished from the dorsal vertebræ by the absence of ribs, and of the surfaces for the attachment of the latter. Behind the lumbar region comes the sacrum, a single bony piece, which sometimes consists of only one vertebra, but is usually composed of three or four amalgamated together, bearing traces of its compound nature in the apertures which indicate the original points of separation of the distinct vertebræ. This bone gives a firm attachment to the *pelvis*, or supporting arch of the hinder limbs, which will be described in treating of those members. The caudal vertebræ are usually numerous, amounting to as many as forty-six in the long-tailed manis. The smallest number of distinct joints is four; but in the human

species, and in some others, the caudal region of the vertebral column is reduced to a mere rudiment.

The structure of the limbs is nearly identical with the description of the typical conformation of the extremities of the vertebrata already given. The anterior limbs are always present in mammals; the posterior are sometimes deficient. The former are articulated to a shoulder-blade or scapula, *Q*, a flat and somewhat triangular bone, usually provided with a strong ridge on its upper surface, which lies amongst the muscles upon the anterior ribs. The shoulder-blades are frequently supported in their position by collar-bones or clavicles, which spring from the fore part of the sternum, and at the opposite extremity articulate with the lower part of the shoulder-blade. These, however, are sometimes wanting, or imperfectly developed. The coracoid bones, which form an important part of the supporting arch of the anterior members in Birds and Reptiles, constituting, in fact, a second and even more powerful pair of collar-bones, only occurs in its full development in one small group of mammals; in the rest it is reduced to a rudimentary condition and amalgamated with the shoulder-blade, of which it forms a small process.

The anterior limb itself usually consists, as previously stated, of the arm-bone or *humerus*, *R*; the *radius* and *ulna*, *S*, *T*; the *carpus* or wrist, *U*; the *metacarpus* or hand, *V*; and the fingers, *W*. These parts all undergo great modifications, not only as regards their form and comparative size, but also by the amalgamation, or total suppression of some of their subordinate constituents. Thus, in the monkeys, Plate 34, fig. 111, we generally find all the parts fully developed, and almost equal in perfection to the same parts in man; in the carnivorous beasts, Plate 33, fig. 105, the various portions of the apparatus are still very distinct, but the great mobility they possess in man and the monkeys is already considerably diminished, to adapt the limbs to the purposes of terrestrial progression; in the seals, Plate 34, fig. 114, and the cetacea, Plate 34, fig. 109, we still recognize the same parts, but with their mutual powers of motion still further limited, to fit them to act as paddles in the water. The ant-eater and the sloth, Plate 33, fig. 107, and Plate 34, fig. 112, also exhibit the same structure, modified in its details to suit particular purposes, and in the latter case displaying a diminution in the number of fingers. With the exception of the aquatic seal and dugong, all the animals to which we have hitherto referred are either terrestrial or arboreal in their habits; but in the bats, Plate 34, fig. 110, we find the anterior limbs adapted for the purpose of flight. In these the arm-bone, *R*, is not very disproportionately elongated, but the bones of the fore-arm, *S*, the metacarpal bones, *V*, and the phalanges or finger-bones, *W*, are of immense length, and these, by stretching a leathery membrane which unites them, enable the bats to raise themselves into the air, and to fly through that element with great swiftness.

In the terrestrial animals to which we have already referred, the radius and ulna were still capable of a certain amount of rotatory motion, although not to the extent presented by the monkeys. In the herbivorous terrestrial mammals, the toes are terminated by hoofs,

by which means the feet are at once admirably adapted for long-continued and swift motion, and completely deprived of all prehensile power. The faculty of turning the fore-foot, consequently, becomes unnecessary, and we find, accordingly, that in the hoofed animals, the radius is reduced to a perfectly rudimentary condition, or amalgamated with the ulna, or altogether suppressed. In the hog, fig. 108, Plate 33, the metacarpal bones and phalanges, of which we find four series, remain distinct, but only the two middle toes reach the ground; the others terminating in the two little hoofs which project from the back of the foot in this animal. In the sheep, fig. 103, Plate 33, the amalgamation and suppression go still further; for here we find only one metacarpal bone and two toes, each covered by a hoof. In the horse, again, even the second toe is suppressed, and with the exception of the wrist, the whole limb is essentially composed of a single series of bones placed end to end. Thus, from the beautiful and delicate organization of the human hand, an organ capable of performing the most varied functions, down to the single toe of the horse, incased in a solid horny hoof, we find an uninterrupted series of steps, by tracing which we may see clearly how the great Designer, by merely modifying a single original plan, has produced creatures destined to play the most various parts in the grand economy of nature. And although we may attribute greater perfection to one form than to another, it must be remembered that such expressions are purely conventional, and that each creature, incomplete as the development of some of its parts may appear when compared with the same parts in other animals, is in reality as perfect, and as perfectly adapted to the purpose for which it was created, as any other; indeed, those very modifications of structure, which, at the first glance, would seem to be imperfections, are found, by careful study, to constitute beauties instead of blemishes in the great spectacle of nature.

We find the same structure, and the same modifications of structure, in the posterior as in the anterior limbs; but in these the mode of attachment to the rest of the skeleton is usually of far greater strength and solidity. The bones of the pelvis, which here take the place of the shoulder-blades and collar-bones, are immovably fixed to the sacrum; and, although in the embryo, and sometimes in the young mammal, there are three of these bones on each side, in the mature animal these are all completely united together; in most cases, also, the two sides of the pelvis are firmly united in the median line below, so as to form a strong but irregular ring of bone.

Near the middle of each side of this ring is the socket for the articulation of the thigh-bone or *femur*, *H*, which is usually a long, cylindrical bone with a nearly globular head, set on it almost at a right angle. Below this, at the knee-joint, are articulated the *tibia* and *fibula*, or shank-bones, *J*, *K*; and these are followed by the *tarsus*, *L*, including the heel, the *metatarsus*, *M*, and the phalanges of the toes, *N*. The correspondence of these bones with those of the anterior limb, will be at once seen by a glance at the figures of the skeletons, Plates 32, 33, 34; and these also show clearly that the modifications already described as occurring in the fore-

leg, are accompanied by corresponding changes in the hinder extremities. The only mammals in which the hinder limbs are wanting are the Cetacea (whales, etc.), and in these the pelvis is represented by a pair of bones, united below in the form of the letter V, and suspended in the muscles below the sacrum, fig. 1 D.

The classification of the Mammalia still generally adopted, and the one which will be followed in the present work, is founded, with some important modifications, upon that of Cuvier, which in its turn was a great improvement upon the system proposed by Linnæus. The great Swedish naturalist divided the Mammalia into seven orders, distributed in three primary sections, called *unguiculata*, or clawed mammals; *ungulata*, or hoofed mammals; and *mutica*, or maimed mammals. The last section includes only the order CETÆ, formed by the whales and allied forms, in which as has already been stated, the hinder limbs are wanting. The hoofed mammals form two orders—the PECORA, or cattle, including the ruminating quadrupeds, and the BELLUÆ, those which do not chew the cud. Of the four orders of clawed mammals, the first or PRIMATES, distinguished by having two pectoral mammae, and by certain characters of the teeth, includes the human species, the monkeys and their allies, and the bats; the second, BRUTA, in which the incisor teeth are wanting, is formed by the sloths, ant-eaters, and allied species; the third, FERÆ, includes the carnivorous mammals; and the fourth, GLIRES, those which, like the rat and the rabbit, have two chisel-like incisors in each jaw.

Cuvier, following the general arrangement of Linnæus, also adopts the same indications of a division of the class Mammalia into three primary groups. But in the Cuvierian system we find no order Primates; and the species of which this Linnæan group is composed are distributed into three orders. Man, as the highest type of organization, is placed in a distinct order, called BIMANA, or "two-handed;" the monkeys and their allies form a second order, that of the QUADRUMANA, "four-handed;" and the bats are associated with the greater part of the Linnæan *Feræ*, to form Cuvier's order of *Carnassiers* or CARNIVORA. Another portion of the *Feræ* of the great Swede were, however, separated by Cuvier, on account of certain singularities in their organization and mode of reproduction, to form the order of *Marsupiaux* or MARSUPIALIA, so called from the females having an abdominal pouch in which the young are protected for some time after their birth. Two other unguiculate orders are admitted by Cuvier. These are called *Rongeurs*, RODENTIA (gnawers), and *Edentés* or EDENTATA (toothless mammals), by the French naturalist, and correspond with the *Glires* and *Bruta* of Linnæus. Cuvier's two orders of hoofed quadrupeds, the *Pachydermes* or PACHYDERMATA, and the *Ruminants* or RUMINANTIA, correspond with the Linnæan groups *Belluæ* and *Pecora*, and both systems are closed by the whales, etc., which form Cuvier's order of *Cétacés* or CETACEA.

The most important new feature in Cuvier's classification of the Mammalia consists in the establishment of the order Marsupialia. These singular animals which, with the exception of the American opossums, are confined to Australia and the adjacent countries, are dis-

tinguished from the rest of the mammals by the very imperfect condition in which the young are born. In the ordinary mammals, when the embryo has attained a certain degree of development, a vascular body called the *placenta* is produced, by which the union of the young animal with the mother is greatly increased. This organ is never formed in the animals arranged by Cuvier in his order Marsupialia; their young are produced in an almost embryonic state, and the mother is usually furnished with an abdominal pouch containing the teats, which serves as a protection to the young animals during their helpless state. This character is referred to in the name given to the order, which is derived from the Latin *marsupium*, a pouch. In order to give the pouch a firmer support than it could derive from the abdominal muscles, the animals are furnished with a pair of peculiar bones (the *marsupial bones*), which spring from the anterior part of the pelvis; the presence of these bones constitutes one of the most important practical characters of the group, as they occur both in the males and females, and even in those species in which the pouch is deficient, or replaced by a mere fold of the skin of the belly.

Besides these characters, there are others of great importance presented by the structure of the brain, in which, as in their reproduction, the Marsupialia evidently exhibit a marked approach to the oviparous classes of Birds and Reptiles. In most of the Mammalia the two hemispheres of the brain are united, besides other bonds of union, by a large band called the *corpus callosum*; this is entirely wanting in the marsupials. The hemispheres themselves are smooth and smaller than in other mammals, leaving the olfactory and optic lobes and the cerebellum perfectly visible when the brain is viewed from above; characters which show a certain resemblance to those of birds.

Taking the whole of the above peculiarities into consideration, nearly all zoologists have not only coincided in admitting the justice of Cuvier's separation of the

animal, presenting them as a distinct order of mammals, but have even gone beyond him, and regarded these creatures, with two singular animals referred by Cuvier to the Edentata, as forming a distinct *subclass* of mammalia, which has been denominated *Aplacentalia* or *Acotyledona*, from the absence of the placenta, the most striking physiological character exhibited by its members. Most naturalists, although regarding the characters presented by the aplacental mammals as indicative of a lower position in the scale of organization than that occupied by the rest of the class, have not failed to perceive that in the characters of the dentition, the limbs, and the general conformation of the body, they present a diversity almost as great as that manifested amongst the Placentalia, so that we find amongst them herbivorous, carnivorous, insectivorous, rodent, and even edentate forms; and thus arose the idea that the two subclasses of Mammalia were rather to be regarded as parallel and mutually representative series than as truly superior and inferior groups. This notion, carried still further, led some zoologists to ignore the section of aplacental mammals altogether, and to distribute its members amongst those orders and families of Mammalia with which, in their other characters, they seemed to be most nearly allied. As, however, these views were for the most part promulgated by writers who had some favourite theory of classification of their own to support, they naturally died with the systems which gave them birth, although it is remarkable that in one of the most recent and valuable works on the Mammalia,* we find the toothless aplacental mammals arranged with the Edentata as in the system of Cuvier, whilst the remainder of the subclass still stands as the order Marsupialia. Dr. Gray, of the British Museum, also places the toothless species with the true Edentata, whilst he follows Linnæus in placing the marsupials amongst the *Feræ*.†

The system that will be adopted in the present work is shown in the following tabular view:—

Subclass I.—PLACENTAL MAMMALS.

A. Unguiculate or Clawed.

- Order 1. BIMANA; the anterior limbs furnished with hands.
- " 2. QUADRUMANA; furnished with four hands; the posterior thumbs opposable.
- " 3. CHEIROPTERA; anterior limbs converted into wings, the fingers being very long, and connected by a membrane.
- " 4. INSECTIVORA; four feet formed for walking; molar teeth broad, with sharp tubercles.
- " 5. CARNIVORA; four feet formed for walking; molars narrow and sharp.
- " 6. PINNIPEDIA; four feet formed for swimming only; molars narrow and sharp.
- " 7. RODENTIA; four feet formed for walking; no canine teeth; incisors two in each jaw, chisel-shaped.
- " 8. EDENTATA; four feet formed for walking or climbing; no incisors or canines in either jaw.

B. Ungulate or Hoofed.

- Order 9. RUMINANTIA; hoofs cloven; incisor teeth wanting in the upper jaw; stomach complicated.
- " 10. SOLIDUNGULA; feet with a single toe and a solid hoof; incisor teeth in both jaws.
- " 11. PACHYDERMATA; feet with two or more toes and hoofs; incisor teeth always in the upper jaw.

C. Mutilated or Defective.

- Order 12. CETACEA; body fish-like; anterior limbs converted into paddles, posterior limbs wanting.

Subclass II.—APLACENTAL MAMMALS.

- Order 13. MARSUPIALIA; teats inclosed in a pouch, or between two folds of the skin of the belly; incisor and molar teeth always present; only one clavicle; external ears.
- " 14. MONOTREMATA; with a single outlet or cloaca, for the urinary, generative, and intestinal organs; no pouch or external ears; teeth wanting or horny in texture; clavicle double.

* Professor Wagner's Continuation of Schreber's *Säugethiere*.

† It must be remarked, however, that the few species of marsupial animals known to Linnæus were all of the ferine family of opossums.

We have not thought it necessary to indicate in the history of the classification of the Mammalia, the different steps by which Cuvier's arrangement has been modified so as to produce the fourteen orders shortly characterized above. These consist in the separation of the *Cheiroptera*, *Insectivora*, and *Pinnipedia*, from the *Carnassiers* of the great French zoologist; in the separation of the horses from the *Pachydermata* of Cuvier, to form the order *Solidungula*, and in the establishment of the order *Monotremata* for the edentulous aplacental mammals, placed by Cuvier and some other authors with the *Edentata*.

In concluding this portion of our subject we must devote a little space to the consideration of a new scheme of classification of the Mammalia lately put forward by the distinguished British comparative anatomist, Professor Owen. Starting from the assumption that the brain, as the centre of the nervous system, the most important of all the constituent elements of the animal body, must necessarily be modified in accordance with the habits, instincts, and powers of the various creatures, Professor Owen has taken the structure of this wonderful organ as the foundation of his system; and from the characters thus obtained he concludes that the two subclasses of placental and nonplacental mammals are not of equal value, and that it would be more proper to divide the class into four subclasses. Of these the first, which Professor Owen denominates the *LYENCEPHALA*, or "loosed-brained," are distinguished by the imperfect union of the two cerebral hemispheres, from the want of the *corpus callosum* already referred to; the hemispheres are smooth and small, exposing the

olfactory and optic lobes and the cerebellum. This subclass corresponds with our *Aplacentalia*.

In a second subclass the hemispheres of the brain are united by a *corpus callosum*, but are not much larger than in the preceding, leaving the greater part of the olfactory lobes and the cerebellum exposed; their surface is slightly convoluted in a few of the largest species of the group, but in the majority they are smooth. From this circumstance Professor Owen proposes to call the animals of this subclass *LISSENCEPHALA*.

Those of the third group have the surface of the brain more or less convoluted, with but very few exceptions. Hence they are called *GYRENCEPHALA*. The cerebral hemispheres are much more largely developed in this than in the two preceding groups, and cover more or less of the cerebellum and olfactory lobes.

Lastly, in the highest subclass, the *ARCHIENCEPHALA*, which includes only the human species, we find nearly the same cerebral characters as in the third group; but the hemispheres are much larger, forming the whole mass of the brain when viewed from above, and the convolutions are deeper and more numerous.

The animals belonging to each of these subclasses present certain anatomical peculiarities in common, which are carefully indicated by Professor Owen in his paper, and appear to lend considerable support to his views. The orders admitted by the learned professor are for the most part identical with those adopted in the present work; the differences in this respect and in the general arrangement will be easily seen from the following table:—

PROFESSOR OWEN'S CLASSIFICATION OF MAMMALIA.		ORDERS.
SUBCLASSES.		
Archencephala,	{	BIMANA.
		QUADRUMANA.
		CARNIVORA.
Gyrencephala,	{	ARTIODACTYLA.
		PERISSODACTYLA.
		PROBOSCIDA.
Lissencephala,	{	TOXODONTIA (<i>fossil</i>).
		SIRENIA.
		CETACEA.
Lyencephala,	{	BRUTA.
		CHEIROPTERA.
		INSECTIVORA.
		RODENTIA.
		MARSUPIALIA.
		MONOTREMATA.

The *Pinnipedia* (seals) have vanished from the list to take their old place amongst the *Carnivora*, and the *Solidungula* no longer figure as a distinct order; but these losses are compensated by the division of the *Cetacea* into two orders, and by the establishment of the order *Proboscida* for the elephants. The principal difference, besides these, between the classification proposed by Professor Owen and that adopted by the present writer consists in the mode of division of the rest of the hoofed quadrupeds. These, with Professor Owen, form the two orders *Artiodactyla* and *Perissodactyla*, or even-toed and odd-toed beasts—the former including the ruminants, the pigs, and the *Hippopotamus*; the latter the horses, the tapirs, the *Hyrax*, and the rhinoceroses. It seems to the author, however, that this mode of arrangement, the principal merit of which consists in its allowing the assignment of a definite place in the system to

the remains of certain extinct species of Mammals, can hardly be regarded as natural when applied to those creatures, the whole of whose organization is known to us. The Ruminants appear to constitute a most natural and well-defined group, which cannot, taking the mass of their characters into consideration, be properly associated in the same order with any other forms of quadrupeds; so that the only course to be adopted would be that of establishing a separate order for the pigs and *Hippopotami*. This, however, does not appear to us to be necessary, and we shall therefore adhere in the present work to the old orders, *Ruminantia* and *Pachydermata*.

As regards the general arrangement or sequence of the orders and the establishment of the subclasses proposed by Professor Owen, no one can venture to give an opinion who has not thoroughly and patiently worked

over nearly the same ground on the same principle of careful and conscientious investigation, in order, if possible, to obtain results which shall either confirm the views advanced by him, or show in what manner some fallacy may have crept into his generalizations. There can be no doubt that although this classification may not eventually be adopted as a whole, it must exercise an important influence on the views of succeeding

zoologists; and we have therefore dwelt upon it here at considerable length, feeling that, although the requirements of a popular scientific work compel us to follow as closely as possible those opinions which are most generally entertained, the reader might fairly charge us with neglect if we omitted to place before him some account of a system which has justly acquired so much celebrity.

ORDER I.—BIMANA.

ALTHOUGH it cannot be denied that man, in his physical relations, is a member of the zoological series, and, as such, must occupy a place in our classification, it is not our intention, nor indeed is it compatible with the general scope of the present work, to enter at any length upon the consideration of the natural history of the human race. The study of this subject is far from being a purely zoological investigation. It includes a careful examination of the political history of mankind, from the earliest reliable records down to our own days, in order that the student may acquire some notion of the migrations performed by different races or varieties of men, and the consequent displacements and intermixtures that have taken place. The moral and intellectual qualities of the various races have also to be taken into consideration; and, of late years especially, the comparison of different languages, both as regards their verbal and grammatical accordance and diversity, has justly been regarded as affording a most valuable clue to guide the investigator in the labyrinth of tribes and nations. It is evident that a subject embracing such various investigations, and entering into the domain of zoology only by its physical aspect, cannot, with any propriety, be considered merely as a branch of zoological inquiry; and of late years the study of the natural history of man has been universally admitted to the rank of a distinct science, under the name of ETHNOLOGY, or the science of races.

If the reader will apply to himself the aphorism "Nosee te ipsum," the only character which Linnæus deigns to give of his *Homo sapiens*, although in a somewhat different sense from that in which it was intended by the Grecian sage, its author—he will find that he is in all points of structure a genuine and undoubted mammal; and the comparison of his organization with that of one of the higher apes, especially the chimpanzee, will leave him in little doubt as to the near approach which these animals make in some respects to the human race. This resemblance is so close in many particulars of structure, that we cannot coincide in opinion with those writers who hold that Man should on no account be admitted into the zoological series, an opinion founded principally upon the consideration of his intellectual faculties and moral qualities; nor can we even assent to Professor Owen's view, that the human race, regarded in its physical aspect, is so distinct in its characters from all other mammals, as to deserve to form a subclass by itself; but we are still further at variance with those writers who, like some modern French zoologists, have reverted to the Linnæan

method, in so far as to revive the order of *Primates* for the reception of man and the monkeys—an intimate collocation of the human species with the lower animals which is exceedingly congenial to the views of those who hold the doctrine of the progressive development of species, or the gradual production of one species from another, by virtue of a law of development pervading all nature.

Independently of purely intellectual considerations, and of the comparative bulk of the brain which is connected therewith, and which of itself, with its concomitant effects upon the size of the skull and proportionately smaller development of the facial bones, would suffice to distinguish Man, even zoologically, from the rest of the Mammalia—we have to remark the perfect organization of every human being for an upright position, involving, as this does, great changes in all parts of the body. The foot is constructed so that the whole sole may be applied to the ground, forming with its arched instep a support at once firm and elastic. The bones of the shank and ankle are so arranged as to confer great firmness and a certain amount of mobility upon the foot; the knee is large and powerful, the thigh long and very muscular, and the pelvis large, strong, and changed in its position so as to allow the whole lower limb to be brought under the centre of gravity of the body. In all these respects we find a great difference between man and the apes, which, being adapted for passing their existence in trees, have the hinder limbs far shorter than in the human subject, the position of the pelvis different, and the articulations of the legs so arranged that the palms of their posterior hands are more or less turned inwards, or towards each other; hence, when an ape walks upright, he is rarely able to apply the whole sole of the foot to the ground, but waddles along upon the sides of his feet in an awkward and uncertain fashion, very different from the firm, elastic tread of man. As we advance upwards in our examination of the human body, we find the spinal column beautifully curved to adjust it to the upright position, and the skull supported nearly in equilibrium upon the first vertebra of the neck; the occipital condyles, or articulating processes, being placed almost exactly under the centre of gravity of the whole head. Thus, the maintenance of an upright position is facilitated in the human subject by every conceivable means, and the object of this modification is evidently to leave him at liberty to make full use of the beautiful and delicate mechanism which constitutes the hand of man. The monkeys, indeed, are all endowed

with grasping hands, and in the majority these are even furnished with opposable thumbs; but these thumbs are much shorter than in the human hand, and the fingers are far from possessing the same amount of independent mobility as those of man. It is to this great perfection of his hand, together with the power which he possesses of making use of this organ, independently of the position of the other parts of the body, in other words, its complete removal from the system of locomotive organs, that man is mainly indebted for his capability of employing the intellect with which it is his proud prerogative to be endowed, and for his power of obtaining a mastery over all the rest of the animated creation. We cannot, in fact, imagine any modification of the human form which would render it a more fitting vehicle for the exercise of the mental powers possessed by man; nor can we conceive the performance of the various actions instigated by those powers by the instrumentality of any other known form of organization. Thus, then, from the general structure of the whole body, we obtain sufficient evidence of the title possessed by the human species to rank as a distinct order in our classification, to stand out clearly at the head of the animated world, and not merely as the highest member of the group of monkeys.

The principal physical characters by which man is distinguished at the first glance from all the other Mammalia are, therefore, as may be gathered from what we have already stated, his adaptation to an erect posture; the great perfection of his anterior members, and especially of his hands; the large size of his brain and skull; and the comparative smallness of the facial bones. Besides these we find other physical peculiarities which equally serve to characterize the order Bimana. Each jaw contains teeth of three kinds, namely, four incisors, two canines, and ten molars; and these are of nearly equal height, and arranged in a continuous series in each jaw, never exhibiting that diversity of size, or the gaps separating the canines from the incisors or molars, which occur in all other living mammals. The molars have their crowns uniformly enamelled, more or less cubical in form, and furnished with obtuse tubercles on the upper surface, a conformation indicative of the adaptation of the human species to a mixed diet. The skin is naked, or but sparingly clothed with hairs, except upon the head and some other parts of the body, and the nails are all flat and broad.

It is unnecessary to dwell upon the intellectual superiority enjoyed by the human race over the lower animals, as this must be sufficiently manifest to every one. The highest intelligence exhibited by an animal must be regarded as inferior to that of a child of two or three years old; and it is only the astonishment felt at witnessing the effects of education upon some of the most highly-endowed creatures, that often leads the superficial observer to attribute to them a higher degree of reasoning power than they really possess. It is, also, in the mind of man alone that has been implanted that belief in the existence of a Deity and in the immortality of his own soul, which is the foundation of all religious sentiment—a sentiment which, although often debased by the most degrading superstitions, seems to be inherent in the human race.

There is one other manifestation of the intellectual powers of man that must not be altogether passed over in silence, namely, the *faculty of speech*, or of producing and understanding articulate sounds. This appears to be peculiar to the human species; for, although there can be no doubt that in many animals there is some power of communicating intelligence from one individual to another, none of them possess a language. It is by means of this peculiar faculty that the progress of mankind is insured. It is by this that the knowledge acquired and the discoveries made in one age, or in one locality, are transmitted to later times or to distant countries; whilst by the reduction of language to written characters, the insecurity of oral tradition is got rid of, and the influence of every discovery is extended and made more permanent.

We come now to one of the most difficult subjects connected with the physical history of man—the question of the primitive unity or diversity of the human species; in other words, whether the original progenitors of the entire human population of the globe were perfectly identical in their essential characters, or whether the diversity which we now observe in different races be the result of a primary specific difference. There is no doubt that when we compare together the extreme varieties of humanity, as, for instance, Europeans, Negroes, American Indians, Chinese, and Australian savages, we may easily find in the form of the head and face, the colour of the skin, the nature of the hair and the general structure of the body, distinctive characters, such as in most cases of zoological investigation would lead us to regard these different forms as belonging to so many species. But this question, unfortunately, cannot be so easily settled; because, between these extremes of diversity we find so many intermediate steps, so many points where the physical characters of different marked varieties seem to be intimately blended, that it is often impossible to say to which of two supposed species a given tribe of men is to be referred.

If we take the opposite supposition, namely, that all the varieties of man have been produced by the modification of a single species, or to put the matter more clearly, the progeny of a single pair, it is difficult to conceive that mere climatal influences and differences in the mode of life could have produced such immense changes, not only in the colour, but also in the conformation of different tribes. One of the strongest physical arguments adduced in favour of the unity of the human species consists in the continued fertility of mixed races, even where the grounds for the establishment of distinct species are apparently the strongest—as, for instance, in the progeny of Europeans and Negroes. But this argument is fallacious, as, although the majority of animal hybrids may be sterile, there are undoubtedly cases in which this rule is departed from; indeed, it is not improbable that some of our most valuable domestic animals are hybrids. The test of colour, which is often relied upon as an indication of variation distinctly referable to a recognizable cause, namely, the influence of a greater or less degree of heat, does not always apply; for although we may state as a general rule, that the inhabitants of hot plains are darker than those of

colder or more mountainous regions, yet there are many important instances that may be adduced in opposition to the universal application of this rule: the most northern tribes are usually of dark complexions, and the natives of Australia and Van Diemen's Land are darker than many tropical nations. The varieties of domestic animals, which are so numerous and often so remarkable, have been produced, for the most part, by the artificial variation of the conditions of their existence; and where they are due to climatal influences, it must be borne in mind that the creatures have been in a manner forcibly transplanted to their new abodes, which they would, in all probability, never have reached but by the instrumentality of man. With the human subject the case is different; his organization adapts him for existence in all parts of the world where he can find the necessary supplies of food: with this restriction, no region is too hot or too cold for him, and this does not merely apply to the indigenous races of each district, for the individuals of most races can live and thrive in the districts originally belonging to other tribes; and in this case, as far as we know, the posterity of the new comers retains the characters of its original progenitors. This is remarkably shown in the present day in the United States of America, where the native American, the European, and the Negro, have now lived and propagated under the same conditions of climate for many years, without losing their original characters. Thus the difficulties are nearly equally great on both sides, and we only partially get rid of them by assuming that a multiplicity of individuals of the human species may have been originally created, and that the gradual intensification of the personal characteristics of these individuals in their descendants by constant intermarriage within the same families, may have given rise to the varieties which are now met with. Otherwise, if production from a single original pair be necessary for the establishment of the unity of the human species, we are forced to admit for it a much greater antiquity of origin than is usually supposed; for we know from ancient Egyptian pictures that, in the Mosaic period, the physical characteristics of the Hebrews, Copts, and Negroes were as strongly marked as in the present day; and it is impossible to suppose that such important modifications of one and the same type would have been produced by climatal influences in the period intervening in our chronology between the epochs of Noah and Moses, and that in the present day we should find different races still retaining their essential characteristics, after dwelling together for many ages in the same region. Moreover, not to mention the chronologies of the Chinese and Brahmins, which appear to run into the opposite extreme to our own, we may refer to the statement of Professor Lepsius, that the chronology of the Egyptians may be traced up to the year 3900 B.C., and that the fourth dynasty, including the builders of the chief pyramids, commenced in the year 3430 B.C. He adds that "a thousand years at least, and probably still more, must be conjectured for the gradual growth of a civilization which had been completed, and had in part begun to degenerate at least 3430 years before our era."—(See Lepsius in Humboldt's *Cosmos*, vol. ii.)

Mr. Leonard Horner, also, in his boring through the sediment of the Nile at Memphis, found a fragment of pottery at a depth of thirty-nine feet from the surface; and as it appears from unquestionable data that, during the last 3215 years, the average amount of sediment deposited has been three and a half inches in a century, this fragment is regarded by Mr. Horner as a proof of the existence of man more than 13,370 years ago—"of man, moreover, in a state of civilization, so far, at least, as to be able to fashion clay into vessels, and to know how to harden them by the action of a strong heat."—(*Proceedings of Royal Society*: 1858.) Perhaps the most probable conclusion at which we can arrive from the consideration of all this evidence is, that the whole human population of the globe belongs to a single species, modified by climatal and other influences, extending over a period of years so long that our authentic historical data relate only to a small portion of it.

As might be expected from the short reference already made to the innumerable shades of difference presented by different tribes of mankind, and the insensible blending of the one into the other, the discrimination of the principal varieties of the human species is by no means an easy task; and we accordingly find that nearly every writer on this intricate subject entertains peculiar views as to the affinities of particular tribes, or even as to the number of primary varieties which it is necessary to admit. Thus, Cuvier refers all the varied forms of mankind to three, Blumenbach to five, Pritchard to seven, and Pickering and Latham to eleven leading varieties. It is principally by the consideration of the structure of the languages that the number of varieties has been so greatly increased by the last-named writers. In their chief physical characters most of the tribes of mankind may be conveniently referred to the five sections proposed by Blumenbach. These are the *Caucasian* or *Iranian*, the *Mongolian* or *Turanian*, the *Malayan*, the *Ethiopian*, and the *American* varieties.

1. CAUCASIANS OR IRANIANS.—This variety includes all those nations which have made the greatest progress in civilization. Their colour depends principally upon the country inhabited by them, the skin in those dwelling in temperate zones being white, more or less tinged with pink in different parts by the blood shining through it; whilst in the nations of warmer climates the colour gradually becomes darker, and finally almost black. The hair exhibits similar, and, to a certain extent, corresponding variations in colour; in temperate climates it presents every shade from red and yellowish-brown to black, whilst in the darker races of hot countries the last-named colour predominates; but in all cases the hair is straight or simply curled, but never crisp and woolly in appearance. The face is oval, and the forehead high, the facial angle approaching a right angle; the eyes are straight; the nose is usually narrow and prominent, and the lips are moderately full. The great Caucasian variety extends from Hindostan through Persia and the Caucasus to Europe, of which the greater part of the inhabitants belong to it; it also includes the nations inhabiting Arabia, Syria, and the northern and north-eastern parts of Africa. The latter,

amongst which we may notice the Arabs, the Jews, the Moors and the Abyssinians, constitute a great sub-variety, distinguished by certain peculiarities, especially of language; they are called the *Semitic*, *Aramaean* or

Fig. 1.



Circassian.

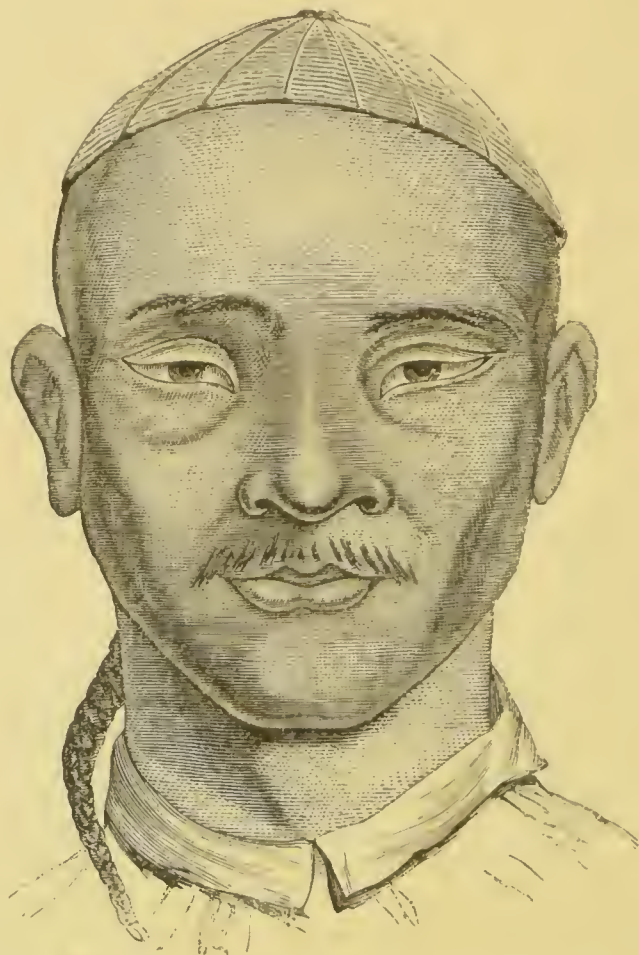
Syro-Arabic races. They are considered by Dr. Latham to form part of the great African variety.

The remainder of the Caucasian races principally belong to a second great stock—that of the *Indo-Europeans*, including the Hindoos, Persians, and all the European tribes, with the exception of the Magyars of Hungary, the Laplanders, Fins, and other Mongolian tribes of the extreme north, and the Basques of Spain, the remains of the ancient Iberians, whose affinities are not yet clearly ascertained. These tribes all speak languages which are considered to be derived from the Sanscrit. The true Caucasian tribes, such as the Circassians and Georgians, are distinguished from the rest by peculiarities of language, which would seem to indicate an affinity with the following variety, whilst the appearance of the people, and especially the conformation of the skull, caused Blumenbach to regard them as the type of the white races.

2. MONGOLIANS or TURANIANS.—In these races the colour of the skin also varies from the clear white complexion of the fairest Europeans, through various shades of olive, tawny, or even yellow, to a dark yellowish-brown. The skull is rounder than in the European races; the face is broad and flat, with very prominent cheek-bones; the eyes are narrow and

small, with the outer angle drawn upwards, so that the direction of the opening of the eyelids is oblique; the nose is small and broad, and the lips usually thin. The Mongolian races are distributed over the whole of

Fig. 2.



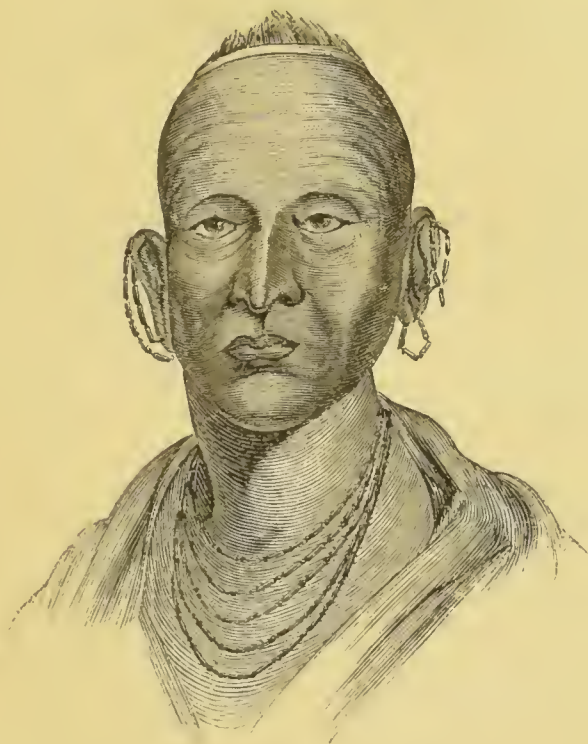
Chinese.

northern and eastern Asia, thus including the highly cultivated Chinese, Japanese, and Siamese, the nomadic tribes which wander over the boundless plains of Central Asia, the Tibetans, the savage hill-tribes of northern Hindostan and the Turcomans of Western Asia. The latter are the original stock of the Turks, who have established their rule upon the ruins of the Greek empire. It is to movements in the vast Mongolian populations of Northern and Central Asia, propagated even from the confines of China, that we are to ascribe those devastating invasions of barbarians which ultimately destroyed the western Roman empire. Even in Europe, the remains of these conquering hordes are still to be found in the Magyars of Hungary, who only obtained a footing in their present domicile in the tenth century of our era. The inhabitants of Lapland and Finland also, with those of the provinces of Livonia and Esthonia, south of the Baltic, and of a large extent of country in the north and east of European Russia, belong to a Mongolian stock, some of them being probably the aboriginal inhabitants of the districts which they at present occupy; whilst others have established themselves where we now find them, by displacing other tribes, either of Mongolian or of Caucasian descent. At the north-eastern extremity of the Asiatic

continent we find the coast occupied by the *Esquimaux* or Eskimo, as they are now frequently termed, which are also regarded as belonging to the great Mongolian variety. These people are remarkable from the fact of their extending from the Asiatic station just mentioned, through the Aleutian Islands to the continent of North America, all the Arctic shores of which, including those of Greenland and Labrador, are peopled by Esquimaux tribes. It is by their means, therefore, that the ethnological connection between the old and new continents has been established; and it seems not improbable that, in the lapse of ages, all the varied tribes of American Indians may have been derived from Esquimaux progenitors. These tribes are, however, considered to form a distinct variety of the human species.

3. AMERICANS.—The skin in these races is usually of a reddish clay colour, sometimes copper colour, but becoming brown or blackish in the hot tropical plains. The hair is long, straight, and usually coarse; the eyes are generally small, but not narrow and oblique as in the Mongolians; and the nose is large, high, and often well formed. The forehead is retreating, and the cheek-bones prominent. In its geographical distribution the

Fig. 3.



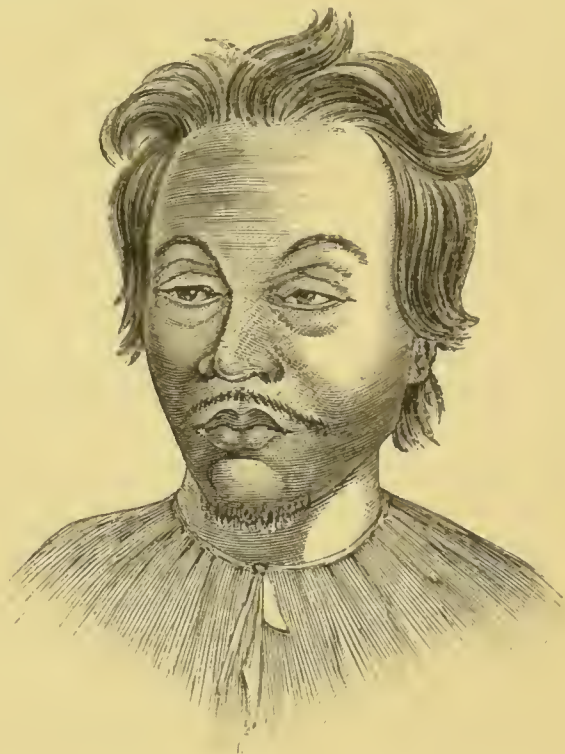
American Indian.

American variety presents a remarkable peculiarity. The other races appear to be more or less limited in their natural extension by degrees of latitude, that is to say, their tribes spread for the most part in an east and west direction, so as to preserve, within certain limits, a similarity of climate. The American man, on the contrary, has spread in the opposite direction, or from north to south, so that nearly from the Arctic circle to the southern extremity of Patagonia, over a space of about one hundred degrees of latitude, the aborigines of America all belong to the same stock and exhibit strik-

ing characters of resemblance, both in their physical conformation and in the structure of their languages. They are for the most part in an uncivilized condition, although, as is well known, the Mexicans and Peruvians had attained to a high state of cultivation before the discovery of the New World.

4. MALAYANS.—The Malayan races, which are also called *Oceanic* by Dr. Latham, are usually of a yellowish-brown complexion, but their colour varies in intensity from a light brownish-yellow to nearly black. Their hair is always black, usually straight, but frequently more or less curled; they have generally a high forehead; narrow, but not oblique eyes; and a broad but not flattened nose. In the general physiognomy we often find an approach to the Mongolian races, some of which are, in fact, the nearest neighbours of the Malays; but in some instances the expression of the face, and even the nature of the hair, present so much similarity to the Negroes, that the populations thus characterized have occasionally been referred to the negro type. The Malayan races include the inhabitants of the peninsula of Malacca, and of the eastern Archipelago, together with those of the Pacific Islands, New

Fig. 4.



Malay.

Guinea, Australia, and New Zealand. The natives of Madagascar are also Malaysians. In the Negritos of Sumatra, Mindanao, and the New Hebrides, the negro characters make their appearance in a remarkable manner, as also in the Papuas of New Guinea and some of the neighbouring islands, in which the hair is of great length and strongly frizzled, standing out from the head on all sides, so as to present the appearance of an enormous wig.

5. ETHIOPIANS.—The races commonly, but incorrectly, called Ethiopians, have the skin of various dark

tints, from deep brown to a nearly perfect black, and the hair short and woolly in its appearance. The forehead is depressed and the jaws prominent, in some

Fig. 5.

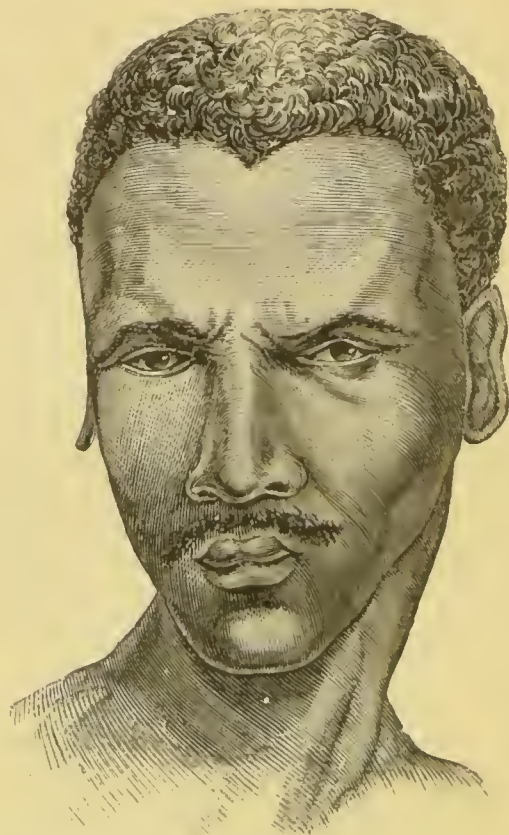


Negro.

cases so much so as almost to form a muzzle; the face is flat, with the cheek-bones not very prominent; the nose is broad and flat; and the lips very thick. The

Ethiopian variety includes all the races of Africa, from the southern and western boundaries of the Semitic nations (Moors, Arabs, and Abyssinians) to the Cape of

Fig. 6.



Caffre.

Good Hope. The principal races are the true Negroes of Central Africa, the Caffres and Hottentots; the Bushmen appear to be a degraded tribe of the latter.

ORDER II.—QUADRUMANA.

THE most essential character of this order is expressed in its name; the animals composing it are furnished with four grasping hands, and in the majority of them these are all provided with opposable thumbs. In some, however, the anterior extremities are altogether deprived of thumbs, so that the posterior feet alone are deserving of the title of hands; and this presence of true hands on the hinder extremities, constitutes the most constant character by which the Quadrumana are distinguished from the rest of the placental Mammalia. It occurs again in the non-placental opossums, and from this circumstance, some naturalists have thought fit to form a single group under the name of Pedimana, or Foot-handed animals, for the reception of the Quadrumana and opossums. The only exception to the character here given, presented by any animal which we refer to this group, is that exhibited by the *Galeopithecus*, or Flying Lemur, a creature which seems to unite the Quadrumana with the Cheiroptera or Bats, having been placed, by different zoologists, sometimes in one and sometimes in the other of these orders. In this there are no opposable thumbs either on the anterior or posterior extremities. From the peculiar

characters presented by the *Galeopithecus*, some zoologists, including Professor Van der Hoeven, have even regarded it as entitled to form a distinct order.

The principal distinctions between the Quadrumana and the Bimana have already been indicated under the latter head; we shall, therefore, confine ourselves here to a general statement of the characters of the present order. The conversion of the hind feet into hands, and the accompanying modifications of the general structure of the hinder extremities, which, as we have already seen, prevent even the highest apes from easily maintaining the erect attitude natural to man, adapt the Quadrumana most admirably for their mode of life, which is, in most cases, strictly arboreal; and as those species which are not inhabitants of the forest, are dwellers amongst the rocks, the advantage, even to them, of their hinder hands will hardly be denied by the most experienced cragsman. Amongst the branches of the trees, the apes and monkeys disport themselves with an agility and security astonishing to the spectator, and the great African baboons are described as scrambling up the faces of nearly perpendicular rocks with the greatest ease.

In the general form of the body we find a great diversity in this order. The apes and monkeys present a greater or less resemblance to the human species; the baboons are more quadruped in their appearance; and the lemurs resemble ordinary quadrupeds in their form. The development of the tail, also, is very variable; some, such as the apes, being perfectly destitute of this appendage, which is also rudimentary in several of the baboons, whilst the majority of the monkeys and lemurs are well provided with tails, and these in the American monkeys are often prehensile, thus furnishing these creatures as it were with a fifth hand, which is of great service to them in their arboreal gambols.

The resemblance in the form of the brain and skull in the apes to that of the same parts in the human species, is greatest in the young animals, and it is owing to this, and to the fact that most of the specimens of the larger apes brought to Europe have been very young, that we are to attribute the exaggerated notions frequently entertained with regard to the extent of this similarity. In the young animals the brain is larger even in proportion to the rest of the body than in full-grown specimens; and as long as the dentition is confined to the milk teeth, the jaws are but little produced, so that the forehead is high, and the facial angle very large; but as the first teeth are shed and the permanent ones produced, the space required for their accommodation becomes greatly increased, and the jaws are necessarily prolonged, whilst no corresponding change takes place in the dimensions of the cranium, and thus the face eventually acquires the form of a prominent muzzle. In the change of teeth, the canines acquire a great development, crossing each other, and interlocking like those of a carnivorous animal, so that the jaws of an adult ape or baboon present an aspect almost as formidable as those of one of the larger cats; and as a consequence of this great size of the canines, gaps are left between these teeth and the incisors or molars, to permit the lodgment of the canines of one jaw by the side of those of the other. The molars, in form, greatly resemble those of the human subject.

The remaining general characters of the order may be dismissed in a few words. Except in the genus *Galeopithecus*, already alluded to, the orbits, or bony sockets of the eyes, are completely closed, as in man. The external ears are usually small, but variable in form, sometimes resembling those of the human species, sometimes erect, as in the cat. The fingers are generally furnished with flat nails, but some species have curved, compressed claws, either on the whole or on some of the fingers. The mammae are almost always placed on the breast, and two in number; in the *Galeopithecus*, there are four pectoral teats; and in the *Cheiromys*, a doubtful species of the order, these organs are situated on the hinder part of the abdomen.

In their geographical distribution upon the face of the earth, the Quadrunana must be regarded as a tropical group. They are found in the forests and rocky deserts of Southern Asia, of Africa, and of South America, where they live in troops, and feed principally upon fruits, often descending to plunder the gardens and fields of the inhabitants. In Africa, the range of the

baboons extends as far south as the Cape of Good Hope; whilst a species of baboon-like monkey, the well-known Barbary ape, not only occurs on the southern shores of the Mediterranean, but even crosses to the European coast, and lives in numerous troops upon the rock of Gibraltar.

This is at present the most northern range of any species of the order Quadrunana; but the fossil remains of these animals found in some European tertiary formations prove, that at a former period of the earth's history several species of monkeys and apes lived upon the continent of Europe, and even in England. In some fresh-water sands at Kyson in Suffolk, the tooth and part of the jaw of a *Macacus*, a monkey allied to the Barbary ape, have been found; these strata belong to the eocene, or earliest tertiary formations. In the miocene, or middle tertiary fresh-water strata, at Sansan in the south of France, M. Lartet in 1837 discovered the first known fossil remains of a quadrunanous animal, considered to be allied to the Gibbons, which are now confined to the islands of the Eastern Archipelago; and in 1856 that geologist also found in the same region, the lower jaw and humerus of a gigantic ape, larger than any known living or fossil species, and presenting, in some respects, a nearer approach to the human species than even the chimpanzee. Other fossil species of monkeys have been found in the south of Europe at Montpellier and near Athens, both belonging to the Indian genus *Semnopithecus*. In the Sivalik hills of Northern India, the remains of several species of monkeys have been discovered by Messrs. Falconer and Cautley, and there is no doubt that as the geological investigation of the warmer regions of the Old World advances, other forms of Quadrunana will be found. The fossil monkeys which have been discovered in some caves in Brazil, belong to the same group as those now inhabiting the South American continent; these are considered to have lived in the pliocene, or latest tertiary period; and it is interesting to find that in this, as in some other cases, there was then the same difference in the type of the mammalian inhabitants of the two hemispheres, as at the present day.

When we examine the various animals belonging to this order, we find that the greater portion of them may be included in two sections—the Monkeys (*Simiæ*) and the Lemurs (*Prosimiæ*). In the former, the incisors are always four in number in each jaw, and the rest of the dentition presents a certain resemblance to that of man; the nails of the fingers are similar, either flattened or claw-like, and those of the thumbs always flat. In the lemurs the number of incisors is variable; and the first finger of the hinder hands is always furnished with a curved, compressed claw. In both these groups the hinder thumb is opposable, and this is also the case with the thumb of the anterior extremities, except in those cases in which it is rudimentary or altogether wanting. There are other points of relationship between these two sections, which may consequently be regarded as forming the true Quadrunana; but, besides these, we have to dispose of two other groups, each including only a single family, and but one or two species, the characters of which are

such as to render the justice of placing them in the present order almost a matter of doubt. These aberrant forms are the *Cheiromys* and the *Galeopithecus* already alluded to.

Commencing with the *Simiæ* or Monkeys, as undoubtedly the highest group of animals, and including the species which approach most closely to man, we find that these also present certain characters, agreeing most remarkably with the geographical distribution of the creatures, by which they may be divided into two sections. The monkeys of the Eastern hemisphere have the nostrils placed close together, and separated only by a narrow septum or partition; the American monkeys, on the contrary, have the nostrils placed wide apart on the sides of the nose, which is broad and flat. Hence the former are called *Catarrhine*, and the latter *Platyrrhine* monkeys.

FAMILY I.—SIMIADÆ.

The Catarrhine monkeys, or monkeys of the Old World, constitute only a single great family, that of the Simiadæ, the genera of which this is composed resembling each other so closely in their most essential peculiarities, and often melting into each other by such imperceptible gradations in their minor characters, that not only is any further subdivision of them into accurately-defined subordinate groups almost impossible, but it is sometimes difficult even to separate the genera themselves by well-marked peculiarities of structure.

All the Simiadæ bear the same number of teeth as the human species, namely, four incisors, two canines, and ten molars and premolars in each jaw, making a total of thirty-two; they also agree with man in the general form and arrangement of the teeth, except that the incisors are more oblique than in any variety of the human race, and there is always a vacant space in the vicinity of the canines. The tubercles of the molar teeth are obtuse. The tail is sometimes altogether deficient, and when present it varies greatly in length, being sometimes a mere tubercle, whilst in other cases it is longer than the body; but it is never prehensile at the tip. Naked raised patches or callosities occur on the buttocks of nearly all the species; these are formed by a thickening of the epidermis supported upon a peculiar process of the ischium, and constitute a sort of natural cushion upon which the animals sit when taking their repose. In most cases, also, these monkeys are provided with cheek-pouches in which they stow away a supply of food for future consumption.

Taking the general characters of these animals into consideration, we may distinguish among them three principal groups—those of the *Apes*, *Monkeys*, and *Baboons*. In the first of these groups, or the true apes, the tail and cheek-pouches are entirely deficient, and the buttocks are either destitute of callosities or have them very small. It is amongst these apes that we find the species most nearly approaching man in their organization; and hence these animals are called *Anthropoid* or *Anthropomorphous* (Manlike) Apes, by most naturalists. Of the species at present known, the one which undoubtedly presents the greatest amount of resemblance to man is

THE CHIMPANZEE (*Troglodytes niger*).—By all authors, with the exception of Cuvier, and one or two who adopted the opinion of that great naturalist, the chimpanzee has been regarded as the highest species of the apes; and the character upon which Cuvier founded his preference for the orang-outan has been shown by later researches to be fallacious. Cuvier states that the volume of the brain and the prominence of the forehead is greater in the orang-outan than in the chimpanzee; and later writers, following Cuvier, have defined the supposed difference in this respect by means of the facial angle, saying that in the orang this angle is 65° , whilst in the chimpanzee it is only 50° . This, however, is due to the comparison only of animals of different ages, the forehead being far more prominent in the young animal than in older individuals of both species, from the projection of the muzzle increasing as the creature approaches maturity; so that, if adult specimens of the chimpanzee and orang-outan be compared together, the difference will be found to be very small, and, if anything, rather in favour of the chimpanzee. The limbs in the chimpanzee, also, more nearly resemble those of man in structure; the arms are not much longer than in the human species, whilst the legs considerably exceed those of the orang in development, both as regards their comparative length, their muscularity, and their capability of supporting the animal in an erect posture. Both in the chimpanzee and the gorilla, the two species of the genus *Troglodytes*, the number of ribs is thirteen, whilst the orang-outan has twelve ribs like the human subject.

The adult chimpanzee measures nearly five feet in height when standing erect. Its body is covered with long, coarse, black or blackish-brown hair, which is very thick upon the back, but clothes the breast, belly, and limbs more sparingly; at the sides of the head and face the hair is very long, and hangs down in the form of whiskers; the face and ears are nearly naked, and of a brownish flesh colour; the ears nearly resemble those of the human species in form, but are very large; the eyes are rather small, and the lips thick. The hands and feet are nearly naked, and the hairs of the fore-arm are directed towards the elbow, where they meet those of the upper arm, and usually project in a point.

The chimpanzee is a native of the vast forests of the west coast of Africa, extending from the river Gambia, north of Guinea, as far as the district of Benguela, or over a space of about thirty degrees of latitude. It lives among the trees, usually avoiding the neighbourhood of man, but forming little huts with branches of trees for its protection from the weather, at an elevation of thirty or forty feet from the ground. Its food consists principally of fruits, and it is also fond of the succulent terminal bud of the cabbage palm, which is likewise a favourite article of human food in tropical regions. In the trees the chimpanzees are very active, and display astonishing strength and agility in their movements; the adult males especially are exceedingly powerful, and from their being armed with large canine teeth are very formidable animals. The chimpanzees are described by several travellers as arming them-

selves with clubs, with which they attack and often kill the negroes whom they meet with in the woods; and they are even said to assault the elephants with the same weapons, and drive them out of their districts. These statements, if true, probably relate to the gorilla, as even the adult male chimpanzee is said to fly from a man. In their sexual habits they are described as being very disgusting; and, according to Dr. Savage (an American missionary to whom we are indebted for the actual discovery of a second species of *Troglodytes*), the Negroes have a tradition that the chimpanzees once belonged to the human race, but that they were expelled from society on account of the incorrigible depravity of their habits.

The chimpanzee does not appear to have been clearly known to the ancients, and yet in a very old Carthaginian voyage, the *Periplus* of Hanno, we have a curious account of an animal which can only be referred to this or the following species. At least five hundred years before our era the Carthaginians appointed Hanno, one of their admirals, to sail with a large fleet through the Straits of Gibraltar, for the purpose of founding Carthaginian colonies along the African coast. According to the journal of this voyage, which has come down to us, the admiral set sail with no less than thirty thousand colonists of both sexes, and coasting along the western shores of Africa, succeeded in establishing numerous colonies at different places. He describes the coast and its inhabitants, and evidently entered the Gulf of Guinea, in which he sailed until he reached a bay called by his interpreters the *Southern Horn*. "In the bottom of this bay," says the Carthaginian admiral, "there was an island similar to the one previously described (in his voyage); this contained a lake, and in this lake there was another island inhabited by wild men. The women were most numerous; they were entirely covered with hair, and our interpreters called them *Gorilloi*. We pursued them, but could not capture the men; they all escaped us by their great activity, as they climbed the rocks and defended themselves by throwing stones at us. We only caught three women, who resisted by biting and scratching their conductors, and we were forced to kill them. We skinned them, and brought back their skins to Carthage." These skins were placed in the temple of Astarte in Carthage, where they remained until the taking of that city in the year 146 B.C., as stated by Pliny, who, however, only mentions two of them, and changes the name of these wild men into *Gorgones*. The *Gorilloi* of Hanno, the *Troglodytes*, Satyrs, and other fantastic creatures described by the ancient naturalists, were regarded by them as monstrous varieties of the human race, and the idea of their existence was probably derived from the imperfect accounts given by travellers of the Anthropoid apes. These notions continued to prevail throughout the middle ages, and it was not until a very recent period that they were replaced by more correct views. Thus, even Linnæus describes a *Homo Troglodytes*, as a second species of man, in which he evidently confuses together the older narratives relating to both the chimpanzee and orang-outan; just as, in his genus *Simia*, he combines these two species under the common name of *S. Satyrus*.

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It was not until the latter part of the sixteenth century, when the intercourse of Europeans with the west coast of Africa became more extended, that the accounts of travellers began to furnish more reliable information upon these large apes, although the earlier of these accounts are for the most part mixed up with fabulous narratives obtained from the Negroes. Andrew Battel, an English sailor, who was taken prisoner by the Portuguese in 1589, and resided for several years in Angola, mentions "two kinds of monsters," as he calls them, which inhabit the woods of that country; of these the largest, which, he says, is of gigantic height, is called *Pongo*, and the other *Enjocko*, by the natives. The former is most probably identical with the newly-discovered gorilla; the enjocko of Battel is, no doubt, the same as our chimpanzee; and we find from later sources that in the district of the Gaboon, the Negroes give the name of *N'Tschégo* to the chimpanzee. De Laval, a Frenchman, who published his travels in 1619, mentions the occurrence of these animals in Sierra Leone, where he says they are called *Barris*, and adds that they may be trained "to perform all the duties of a household servant." He states that they "generally walk upright, upon the hind feet only; they will pound grain or any other substance in a mortar, go to the well, fill their water-jars and carry them home on their heads; but if some person be not at hand to relieve them from their burden on their arrival, they let the jar fall, and begin to cry on seeing it broken." Jobson also describes an ape of five feet in height, called by the Negroes *Quoja Vorau*, which, according to him, can be taught to fetch water and to perform other household offices. De la Brosse, in his "Voyage to the Coast of Angola," published in 1738, refers to the species under the name of *Quimpezé*, but seems to have mixed up the chimpanzee and the gorilla, for he describes the animals as attaining a height of six or seven feet. He confirms many of the facts narrated by preceding travellers, and makes especial mention of the abduction of Negresses by these creatures, a habit which is so commonly ascribed both to the large apes and the baboons, stating that he was acquainted with a woman at Loango who lived three years amongst these animals. This account of the predilection of the chimpanzees for human concubines is confirmed, from hearsay, by Smith, who visited the coast of Guinea in 1744, and who says the animal is there called *Mandrill*; in fact, it appears that the name of *Drill*, commonly applied to one of the large baboons, really belongs to the chimpanzee, and that it is the root of the Greek word *Gorilloi*, given by Hanno as the name of his wild men. These narratives, with the exception of Battel's, probably refer both to the pongo and the enjocko of the latter.

The first specimen of the chimpanzee seen in Europe was a young living individual, which was brought to Holland towards the end of the seventeenth century. This specimen, which was from Angola, was described by Tulpius, who, however, confounded it with the orang-outan, in which, as already stated, he was followed by Linnæus. Buffon, also, who had the opportunity of examining at least one living specimen of the chimpanzee, did not recognize its distinctness from the orang. It was first described under the name of *Simia*

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Troglodytes by Blumenbach; and M. Geoffroy Saint-Hilaire regarded it as the type of the distinct genus *Troglodytes*, in which he has been followed by most subsequent zoologists. The anatomical structure of the chimpanzee was well described as long ago as the year 1699, by an English anatomist, Tyson, in his "Anatomy of a Pigmy," where he enters into a detailed exposition of the characters in which this animal resembles and differs from man.

The individuals which have been brought alive to Europe and exhibited in our menageries, have all been young animals, usually about two years old, and between two and three feet in height; they can, consequently, give us but little idea of the habits and disposition of the adult chimpanzee. They have all exhibited a striking amount of intelligence, and a gentleness and docility such as we hardly associate with the idea of a monkey. The individual observed by Tyson in 1699, is described by him as a gentle, affectionate, and harmless creature, which became much attached to the sailors on board the ship in which it was brought to England, embracing them with the greatest tenderness, opening the breasts of their shirts, and clasping its arms around them. It showed a great aversion to some small monkeys which were brought home in the same ship, keeping at a distance from them, as if it considered itself a being of a superior order. It became fond of wearing clothes, would dress itself partly, and apply for assistance in any difficulty to some of the crew or passengers.

The celebrated French naturalist, Buffon, has given the following interesting account of the chimpanzee observed by him, which he calls the *Jocko*, but confounds with the orang-outan. He says—"Its air was melancholy, its deportment grave, its movements measured, its disposition gentle, and very different from that of the other monkeys; it had none of the impatience of the magot (Barbary ape), the ferocity of the baboon, or the extravagance of the monkeys. It may be said that it had been well taught; but the others had also received their education; a sign or a word was sufficient for our orang-outan; whilst the baboon required the stick, and the others the whip, as they only obeyed under the fear of chastisement. I have seen this animal present its hand to lead out its visitors, or walk about with them gravely as if it belonged to the company. I have seen it seat itself at table, unfold its napkin and wipe its lips, use its spoon and fork to carry its food to its mouth, pour its drink into a glass, and touch glasses when invited; fetch a cup and saucer to the table, put in sugar, pour out its tea and leave it to cool before drinking it; and all this without any other instigation than the signs or words of its master, and often of its own accord. It was perfectly harmless; it even approached one with a certain respect, and presented itself as if to ask for caresses. It was excessively fond of sugar-plums, . . . but ate almost anything, although it preferred ripe and dry fruit to all other aliments; it drank wine, but in small quantity, and left it willingly for milk, tea, or other mild beverages."

This description is interesting, as showing the amount of education of which the chimpanzee is susceptible; but, perhaps, the most striking example of the intelli-

gence of this ape is recorded by the French traveller, De la Brosse, whose "Voyage to Angola" has been already referred to. One of two young chimpanzees purchased by this traveller, was taken ill on board ship. "He gave himself all the airs, and demanded the same care as a human being; he was even bled twice in the right arm; and afterwards, whenever he felt indisposed, he would hold out his arm to be bled, as if conscious that it had done him good."

Subsequent observations of other specimens in confinement have not only confirmed the idea of the great intelligence and gentleness of the chimpanzee conveyed by the preceding extracts, but have also thrown more light upon the natural habits of the species, and enabled recent zoologists to correct some errors into which their predecessors had fallen. Thus Buffon, writing from recollection, states that his *Jocko* "always walked upright on its hind feet, even when carrying heavy loads." The individuals since observed have shown that if this was the case, it must have been a result of education. The chimpanzee, certainly, appears to have a greater power of sustaining itself in a nearly erect posture than the other apes; but in its natural mode of progression it exactly resembles the latter, its body being inclined forward in walking, and supported upon the anterior limbs, of which the knuckles are applied to the ground.

THE GORILLA (*Troglodytes Gorilla*), Plate 1, fig. 1.

—We have already, in treating of the chimpanzee, indicated that, from the narratives of the older travellers there has always been reason to believe that two large species of apes lived on the west coast of Africa. The curious recital of Hanno, already quoted (see page 17), may indeed apply to either species; but as early as the close of the sixteenth century, we have seen that Andrew Battel clearly indicates "two kinds of monsters" as inhabiting the woods of Angola: one of these is the chimpanzee; the other, he says, "is called *Pongo* in their language." Of the latter he states, that "the pongo is in all his proportions like a man (except the legs, which have no calves), but he is of gigantic height. The face, hands, and ears of these animals are without hair; their bodies are covered, but not very thickly, with hair of a dunish colour. When they walk on the ground, it is upright, with the hands on the nape of the neck. They sleep on trees, and make a covering to shelter them from the rain. They eat no flesh, but feed on nuts and other fruit; nor have they any understanding beyond instinct. When the people of the country travel through the woods they make fires in the night, and in the morning when they are gone the pongos will come and sit round it till it goes out; for they do not possess sagacity enough to lay on more wood. They go in bodies, and kill many Negroes who travel in the woods. When elephants happen to come and feed where they are, they will fall on them, and so beat them with their clubbed fists and sticks, that they are forced to run away roaring. The grown pongos are never taken alive, owing to their strength, which is so great that ten men cannot hold one of them. The young hang upon their mother's belly, with their hands clasped about her. Many of them are taken by shooting the mothers

with poisoned arrows." Another early English traveller, Jobson, and Pyrard de Laval, a Frenchman, appear to have combined the accounts of the *Pongo* of Battel with the chimpanzee, as was also done at a much later period (1738) by De la Brosse. The narratives of these writers have already been quoted. (See page 17.)

This view of the identity of the two African apes was adopted by Buffon, who regarded the pongo as the adult of the animal described by him under the name of the jocko, and at the same time confounded both with the orang-outan of the great Eastern Islands. Later naturalists, whilst admitting the specific and even generic difference of the orang and the chimpanzee, still referred all the accounts of the large African apes to the latter; and it was not until the year 1829 that attention was called by Mrs. Bowdich to the reported existence of a second species of ape on the West African coast. At the close of a paper on the habits of the Diana monkey, published in *Loudon's Magazine of Natural History*, that talented lady refers briefly to the accounts which she had heard of the existence of an animal named *Engé-ena* in the countries to the north of the Gaboon river. She says:—"The natives describe it as the largest of all monkeys, but of a breadth more tremendous than its height; they declare that one blow of its paw would fell a man to the earth. Both males and females are very much attached to their young, and the latter carry them about after death until they drop from their arms. They are fond of imitating men; walk upright; and having seen the natives collect ivory, if they find a tusk, they carry it on their shoulders till they sink with fatigue." Although some of these statements are doubtless fabulous, others have been fully confirmed by recent authorities, and it is remarkable that this reference to the gorilla should have hitherto escaped the attention of naturalists. It was only in 1847 that certain evidence of the occurrence of a second species of African ape was obtained. In April of that year, Dr. Savage, an American missionary, on paying a visit to one of his *confrères*, Dr. Wilson, stationed on the Gaboon river (situated almost exactly under the equator), obtained several skulls of individuals, of both sexes and of different ages, together with some other portions of the skeleton of a large ape, which appeared to him to differ both from the orang and from the chimpanzee. On his return to America, Dr. Savage, with the aid of Dr. Wyman, drew up a description of these bones, which was published in 1840 in the *Boston Journal of Natural History*; he called the species *Troglodytes Gorilla*, conceiving that it was identical with the *Gorilloi* of Hanno. In the following year, Professor Owen, who had received sketches of the skulls from Dr. Savage, and had subsequently obtained some specimens by the aid of Mr. Stutchbury of Bristol, described the species under the name of *Troglodytes Savagei*; and in 1849 an adult male specimen, preserved in spirits, was brought to Paris by Dr. Franquet, a French naval surgeon. A skeleton was subsequently procured for the British Museum, where it has now been for some years; and within the last few months a fine male, nearly adult, and preserved in

spirits, was also obtained, and by this the title of the animal to rank as a distinct species has been finally established.

This specimen, which is about five feet in height when placed in an erect position, has the face and the palms of the hands and feet naked and black. The head and neck are thickly covered with brownish grizzled hair of moderate length, which does not hang down at the sides of the face so as to form whiskers, as in the chimpanzee. The ears, also, are much smaller than in the latter species; they are placed very high and far back on the sides of the head. The hair of the shoulders and upper part of the arms is grizzled; that of the back and loins has a sooty tinge. The fore-arms are covered with stiff, black hair, directed up towards the elbow as in the chimpanzee. The hair on the chest is very scanty; but the belly is more thickly clothed, and the hair of this part is reddish-brown, and exceedingly coarse and harsh, having a withered appearance. One of the most remarkable characters of the species, which is now commonly known as the *Gorilla*, is that the digits of both pairs of extremities are united together much further than in the chimpanzee, whose hands nearly resemble those of the human species; in the new species, on the contrary, the fingers of the hands are united nearly as far as the ends of the first phalanges, whilst in the hinder hands the union even goes beyond these, leaving only four little stumpy fingers free. The thumb of the anterior hands is comparatively small; but that of the hinder pair is of enormous size and power, and the whole foot forms a grasping apparatus of the most tremendous character. From the callous marks upon the knuckles it is evident that the *Gorilla*, when on the ground, walks upon all-fours, and that he does not apply the whole lower surface of the foot to the ground; in fact the digits of the hinder hands appear to be bent naturally in such a way as to render this impossible.

The inspection of the specimen above described, which has been most admirably prepared, in spite of almost insuperable difficulties, by Mr. Bartlett, is quite sufficient to justify all the accounts given by travellers of the fearful powers of the gorilla. Although not fully mature, as is shown by the state of its dentition, the vast bulk of its body, far exceeding that of even the most powerful men, its long arms, and enormously large hands and feet, produce an impression of almost irresistible strength; and when we consider that besides this enormous grasping power—to attempt to escape from which would be utterly hopeless—the adult male is furnished with canine teeth as large as those of a carnivorous beast, set in immensely powerful jaws, of which the lower one, as evidenced by the great development of the crests upon the skull, is moved by temporal muscles of enormous bulk; we can easily imagine that such a creature must be one of the most terrible antagonists that a man could well meet with, and cease to wonder that the Negro elephant-hunters should dread him even more than the lion.

Whether the gorilla really attains the immense size of six or seven feet attributed to him by some travellers, is still rather doubtful. The specimen in the Paris

Museum measured about five feet four inches in total height; and a missionary named Walker is said to have obtained one measuring five feet eight inches, but this is the largest on record. Considering the structure of the animal, however, we can easily believe Battel's statement that ten men would be unable to overcome a single adult even of this size; and the great dread which the natives entertain for it, coupled with the difficulty of transplanting such a huge carcass through its native forests to any place frequented by Europeans, is a sufficient explanation of our long ignorance even of the existence of the gorilla.

From the statements of Dr. Savage and others, it appears that the gorilla inhabits the district through which flow the Gaboon and Danger rivers. Its dwelling is in the interior of the country, whilst the chimpanzee is met with on the coast. The tribe of Negroes inhabiting this district is called Mpongwe, whence, according to Dr. Wilson, is derived the name of *Pongo*, applied to the species by Battel—the native name of the animal being *Engé-ena*.

In their native forests the gorillas live in troops, which, however, are not so numerous as those of the chimpanzees, and consist principally of females; and all the natives who furnished Dr. Savage with information upon their habits, agreed in stating that there is only one adult male to each troop, and that as the young males grow up, they engage in contests for the superiority, when the strongest, by killing or driving off all the others, establishes himself as the chief of the band. The adult male, according to the statements of the Negroes, never meets a man in the woods without attacking him. When first seen, he sets up a fearful howling, the sound of which has been compared to the syllables *kha-ah! kha-ah!* opens his mouth to exhibit his terrible teeth, and contracts the skin of his face, so as to acquire an appearance of incredible ferocity. The females and the young disappear with the first sound of battle, and the male then advances upon his enemy in a state of perfect fury, repeating his cries at every step. Of course the hunter's only chance under such circumstances is to kill his assailant with a single shot; and as this is not always an easy matter, the Negroes are said to recommend the adoption of a course which certainly requires more coolness than falls to the lot of most men. The best plan of making sure of a gorilla, according to this account, is to allow him to approach until he grasps the barrel of the gun, and then to fire at the moment when, as his custom is, he is about to bite the muzzle. If the piece miss fire, the gorilla is said to crush the barrel between his teeth, when, of course, he makes short work with his unfortunate antagonist. Hence, as we may suppose, the Negroes are not very anxious to go in pursuit of the gorillas, and only attempt their destruction in self-defence, when they come suddenly upon them in journeying through the forest, or in their elephant-hunting expeditions. The destruction of a gorilla is looked upon as a most honourable exploit. Dr. Savage records a case in which a Negro slave, having succeeded in killing an elephant, on his return met with a male gorilla, which, being a good marksman, he shot, and soon afterwards, falling in with a female, killed her also.

These feats, performed in a single day, were looked upon as almost superhuman; the fortunate slave was immediately set free, and pronounced the prince of hunters. Captain Wagstaff, who brought the first skulls of the gorilla to England, furnished Professor Owen with information of a somewhat similar nature, and added that when the natives succeed in killing one of these animals, they make a *fetish* of the skull; those brought home by him had been used in this way, and still exhibited traces of sacred marks in the form of red and white streaks. Although the male is thus so formidable an enemy to man, Dr. Savage denies that there is any truth in the stories of their forcing Negroes to accompany them to their retreats in the woods, or attacking the elephants with clubs, narrated both of this and the preceding species by the older writers. These stories, however, are confirmed by a recent French traveller, M. Gautier Laboulaye; but upon what authority does not appear. Their food, as stated by Battel, consists of nuts and fruits; and, according to Dr. Savage, they are especially fond of the acid fruits of some species of *Amomum*, and of those of the oil palm (*Elais guineensis*), the Papaw (*Carica papaya*), and the Banana (*Musa sapientum*). They are also said to be partial to sugar-canes.

THE ORANG-OUTAN (*Simia Satyrus*). Plate 1, fig. 2.

The remarkable man-like apes of the great Indian islands, appear to have been entirely unknown to the ancients, unless Pliny's mention of Indian satyrs refers to the orang-outan. It is not, indeed, until the middle of the seventeenth century, that we find any notice of these animals in the writings of Europeans. About this period, the *Orang-outan* is mentioned by Johnston in his "Historia Animalium," but described as brought from Angola. In 1658, however, some genuine observations upon the orang, were published in Holland; their author, Bontius, a Dutch physician residing in Batavia, having seen "several of these satyrs of both sexes" in that country. The English anatomist, Tyson, whose work on the chimpanzee has already been quoted, also refers to the orang-outan, upon the appearance and habits of which he had obtained some details from a French missionary, named Lecomte; and a little later, Leguat, a French voyager, gave a description of a large ape which he saw in captivity in Java, and which could only have been an orang-outan. The notices of the species then become more frequent in works on Natural History; but the two great authorities of the eighteenth century, Linnæus and Buffon, both agreed in regarding the great Indian and African apes as belonging to a single species. They were imperfectly distinguished by Gmelin, who still describes the pongo as a variety of the orang-outan, inhabiting both Java and Guinea. Since the chimpanzee has been clearly recognized as a species distinct from the orang, there has been a tendency to multiply the species of the large Eastern apes; and we find no less than six supposed species described by different authors, principally from peculiarities in the structure of the skeleton. It would appear, however, from the recent observations of Mr. A. R. Wallace upon the orangs of Borneo, that some

of the characters which have been chiefly relied upon for the discrimination of these species are fallacious. The Bornean orangs all seem to be referable to two species, the differences between which are, as Mr. Wallace observes, well marked in the males, but much less distinct in the females. Both these species appear to be called *Orang-outan*, or "man of the woods," by the Malays of the coast of Borneo, but the Dyaks, who are more familiar with them, call them *Mias*, and distinguish two or three kinds by particular names.

The largest species found in Borneo, and the one which is most abundant there, may be regarded as the true orang-outan, or *Simia Satyrus* of Linnæus. It is called *Mias Pappan*, *Mias Chappan*, and *Mias Zimb* by the natives; the second name, according to Sir James Brooke, being applied to it by the Malays. The arms are of great length, reaching nearly to the heel when the animal is in an erect posture; the body is covered with long reddish hairs, which form a long beard pendent from the chin; the hairs of the fore-arms are turned towards the elbow, in the same way as in the chimpanzee and gorilla; the face is naked, and, in the males, greatly expanded at the sides by two large fatty protuberances on the cheeks; the ears are small and rounded, and greatly resemble those of man in form; and the lips are very large, and capable of being protruded and retracted to a great extent. The largest adult males met with by Mr. Wallace in Borneo, measured four feet two inches in height, from the crown of the head to the heel; but if we can believe the accounts of other travellers, the species must attain much larger dimensions. M. Temminck mentions his having heard of a Bornean specimen of five feet three inches in height; and a specimen from Sumatra, described by Dr. Clarke Abel, was said to measure about seven feet. The females are considerably smaller than the males.

In the orang there is a remarkably large guttural pouch descending in front of the sternum, and communicating with the wind-pipe, from which it may be greatly inflated with air. This occurs also, although far less developed, in the chimpanzee and gorilla.

The observations of M. Salomon Müller, and of Mr. Wallace, have furnished us with a tolerably complete history of the orang-outan in a state of nature. This animal lives in the lofty primæval forests of Borneo and Sumatra, but only in the swampy districts, where the forest is unbroken, and the interlacing branches afford him a means of passing readily from tree to tree, without the labour of descending to the ground. Mr. Wallace describes it as a "singular and most interesting sight to watch a *Mias* making his way leisurely through the forest. He walks deliberately along the branches, in the semi-erect attitude which the great length of his arms, and the shortness of his legs give him; choosing a place where the boughs of an adjacent tree intermingle, he seizes the smaller twigs, pulls them towards him, grasps them together with those of the tree he is on, and thus, forming a kind of bridge, swings himself onward, and seizing hold of a thick branch with his long arms, is in an instant walking along to the opposite side of the tree. He never jumps or springs, or even appears to hurry him-

self, and yet moves as quickly as a man can run along the ground beneath." Unlike the chimpanzee and the gorilla, it is a solitary creature; Mr. Wallace says, that he has "never seen two adult animals together; but both males and females are sometimes accompanied by half-grown young ones, or two or three of the latter go in company."

When not disturbed, or in search of food, the orang appears to be sedentary in its habits. It sleeps every night on a nest made by breaking off the leafy branches of trees, and laying them over each other upon a forked horizontal branch, until it forms a bed so thick as to conceal it entirely from below; in rainy weather it is also said to cover itself in a similar manner with small branches and leaves, and to keep its bed till about nine o'clock, when the sun has become hot enough to disperse the mists. The nest is usually placed at about fifty or sixty feet from the ground. As the same animal appears seldom to use these nests more than once or twice, they are very abundant in places frequented by the *mias*.

The food of the orang-outan consists almost entirely of fruits; but when these are scarce, the tender shoots and leaves of trees do not come amiss to him. An old male was once found to have in his stomach fragments of the bark of trees of upwards of a foot in length. According to Mr. Wallace they seem to prefer their fruit unripe, and many of them are intensely bitter; particularly the large, red, fleshy arillus of one fruit, which seems to be an especial favourite. Of another large fruit they only eat the small seed, and in search of this destroy great quantities of the fruit. "The Durian (*Durio zibethinus*)," says Mr. Wallace, "is also a great favourite, and the *mias* destroys large quantities of this delicious fruit, in places where it grows surrounded by lofty jungle, but will not pass over clearings to get at them. It seems wonderful how the animal can tear open this fruit, the outer covering of which is so thick, tough, and densely covered with strong, conical spines. It probably bites a few of these off first, and then, making a small hole, tears the fruit open with its powerful fingers." In some places the orangs appear to be somewhat migratory in their habits, moving after particular fruits of which they are fond; thus they are said to move into the southern parts of Borneo, and to make their appearance on the right bank of the river Dousson, at the period when the fruits of a certain species of fig (*Ficus infectoria*) are ripe. After this they disappear from those localities. They seem rarely to descend to the ground except in search of water, which they drink by taking a little up in their hands and letting it flow into the lower lip, which is protruded so as to form a sort of channel for this purpose. When on the ground they walk on all-fours, like the other apes, and appear to have less power of maintaining themselves in an erect posture than the chimpanzees. Some individuals, in confinement, have been seen to move along a flat surface by resting on the knuckles of their hands, and then throwing the body and legs forward in the manner of a lame man on crutches; this mode of progression is not natural to the species, as has been supposed, but appears only to be adopted by sickly individuals.

The orangs appear to have little fear of man, but will often stare down upon an intruder for a few minutes and then remove slowly to a short distance. When pursued, however, as they often are by the Dyaks, who kill them with poisoned arrows and eat their flesh, they manifest some alarm, and endeavour to get as quickly as possible into the loftiest tree in their neighbourhood, when they climb rapidly to the higher branches, breaking off the smaller boughs in their passage, and throwing them down as if to intimidate their pursuers. This habit has been exaggerated by some travellers into a truly offensive action, and the orang has been described as throwing branches down at its enemies; whilst, on the other hand, M. Temminck has altogether denied that the creature breaks the boughs on purpose to throw them down. According to Mr. Wallace, however, this is actually the case, although, as he states, the orang "does not throw them *at* a person, but casts them down vertically." He adds that "in one case, a female mias, on a durian tree, kept up for at least ten minutes a continuous shower of branches and of the heavy spined fruits, as large as 32-poublers, which most effectually kept us clear of the tree she was on. She could be seen breaking them off and throwing them down with every appearance of rage, uttering at intervals a loud pumping grunt, and evidently meaning mischief."

In this way the orang remains at the top of the tree on which he has taken refuge, never venturing to descend either to attack his pursuers, or to escape, by means of the interlacing lower branches, to another tree; but when badly wounded, he sets about making a bed similar to his ordinary nightly lair, on which he lays himself down to die. This nest effectually screens him from below, and he will not quit it after it is once completed. Mr. Wallace states that he lost two specimens in this way; they died upon their beds, and he could not get any one to climb up or cut down the tree until the next day, when decomposition had commenced.

The tenacity of life in the orangs is exceedingly great, and it usually requires from six to twelve bullets in the body to kill them. An example of this tenacity of life was afforded by the Sumatran specimen described by Dr. Clarke Abel, and already alluded to on account of its great size. This animal was found at a place called Ramboon, on the north-west coast of Sumatra, by a boat's crew who had landed to procure water. He was upon one of a few trees standing in the midst of cultivated ground. On the approach of the party he came to the ground, but soon made his escape to another tree at a little distance, and was afterwards driven to take refuge in a small clump. Here his movements were so quick that it was very difficult to get a shot at him; and it was only after cutting down several of the trees that his pursuers succeeded in shooting him. He received five balls, some of which struck him in the body, when he relaxed in his exertions, and reclining exhausted on one of the branches of a tree, vomited a considerable quantity of blood. "The ammunition of the hunters being by this time expended," says Dr. Abel, "they were obliged to fell the tree in order to obtain him; and did this in full

confidence that his power was so far gone that they could secure him without trouble; but were astonished, as the tree was falling, to see him effect his retreat to another with apparently undiminished vigour. In fact, they were obliged to cut down all the trees before they could drive him to combat his enemies on the ground, against whom he still exhibited surprising strength and agility, although he was at length overpowered by numbers, and destroyed by the thrusts of spears, and the blows of stones and other missiles. When nearly in a dying state, he seized a spear made of a supple wood, which would have withstood the strength of the stoutest man, and shivered it in pieces. In the words of the narrator, 'he broke it as if it had been a carrot.' It is stated by those who aided in his death, that the human-like expression of his countenance and piteous manner of placing his hands over his wounds, distressed their feelings, and almost made them question the nature of the act they were committing. When dead, both natives and Europeans contemplated his figure with amazement. His stature, at the lowest computation, was upwards of six feet—at the highest it was nearly eight;" but, from the examination of the skin, Dr. Abel concludes that he must have been about seven feet in height.

M. Salomon Müller also mentions a male orang, about four feet in height, which had been wounded by the Dyaks with poisoned arrows, and afterwards captured by them alive. Although suffering greatly from his wounds, this animal exhibited great strength and ferocity; he would rise slowly from his ordinary crouching position, and then, seizing a favourable moment, would dash impetuously towards the spectators, darting his long arms through the bars of his cage, and generally attempting to reach the faces of those nearest to him.

Like the other apes, it appears that the orang, when attacked, never makes use of his large canine teeth to defend himself, but trusts entirely to the enormous strength of his long arms. His enemies, however, in the forest solitudes which he frequents are very few. In Sumatra, the tiger may occasionally pounce upon an unlucky orang, when on his way to the water; but in Borneo, the only inhabitant of the forests that would be at all a formidable enemy to the orang is the Bornean bear, and as this animal is almost as exclusively devoted to a vegetable diet as the orang himself, it is hard to see what cause of quarrel can arise between them. Mr. Wallace says—"The Dyaks are unanimous in their statements that the mias never either attacks or is attacked by any animal, with one exception which is highly curious, and would hardly be credible were it not confirmed by the testimony of several independent parties, who have been eye-witnesses of the circumstance. The only animal the mias measures his strength with is the crocodile of these regions (*Crocodilus Bipoecatus*?). The account of the natives is as follows:—"When there is little fruit in the jungle, the mias goes to the river side to eat the fruits that grow there, and also the young shoots of some palm-trees which are found at the water's edge. The crocodile then sometimes tries to seize him, but he gets on the reptile's back, beats it with his hands and feet

on the head and neck, and pulls open its jaws till he rips up the throat. The mias always kills the crocodile, for he is very strong. There is no animal in the jungle so strong as he."

The female orangs, like the other large apes, produce only one young at a birth, and this clings for a considerable time to the long hair of its mother's body, and is thus carried about; the four limbs of the mother being left at perfect liberty. In fact, so little does the presence of a young one impede the movements of the mother, that Mr. Wallace mentions his having shot two females, bearing their young in this way, without being aware of the existence of the latter until both fell to the ground. It is by shooting the mothers that the natives obtain nearly all the young orangs which they sell to Europeans.

For some time after their birth, the young orangs appear to be nearly as helpless as the human infant, although of course the mere fact of their supporting themselves by grasping the hair of their mother, is evidence of a far greater amount of strength than is possessed by a young child. Mr. Wallace has published a most interesting account of the habits of an "infant" orang-outan which he obtained by shooting its mother, from which we shall extract a few passages. He fed it with rice-water out of a bottle with a quill in the cork, which, after one or two trials, it sucked very well. "When a finger was placed in its mouth, it would suck at it with remarkable vigour, drawing in its little cheeks with all its might, thinking, no doubt, it had got hold of the right thing at last, and wondering that all its exertions could get no milk out of it. It would persevere for a long time, till at last it gave up with despair and disgust, indicated generally by a very baby-like scream." It was quiet when nursed, but cried when laid down alone. When being washed it winced, "and made ridiculously wry faces" when the cold water was poured on its head, but it enjoyed being rubbed dry, and was particularly delighted with being brushed. At first it clung vigorously with its four hands to anything that was within its reach; and on one occasion having caught hold of its owner's whiskers and beard, clutched them so tightly that he had considerable difficulty in getting free. From the want of its natural grasping exercise, Mr. Wallace found that his baby orang was getting rather weak in its limbs, and he therefore contrived a sort of ladder upon which it might hang. This, however, did not answer; the sticks not affording it a convenient hold for all its four hands. It would hang for a time by two hands only, and then, getting tired of this posture, would move one hand over to the opposite shoulder to grasp its own hair; when "thinking, no doubt, that that would support it much better than the stick, it would leave hold with the other hand, and come tumbling down on to the floor." Mr. Wallace then prepared a sort of artificial mother for it, by rolling up a piece of buffalo-skin into a bundle with the hair outside. This suited it much better, but, unfortunately, it was only too natural. "The poor little creature thinking it had recovered its mother was continually trying to suck. It would pull itself up close by the strength of its arms, and try everywhere for a likely place, but only succeeded in getting mouthfuls of

wool, when of course it would be greatly disgusted, scream violently, and if not rescued would soon let itself fall."

When fed with a spoon this infant orang indicated its approval or dislike of the food offered to it by the most ludicrous changes of its countenance—licking its lips, drawing in its cheeks, and turning up its eyes, like a true epicure, when the food was to its taste—turning the mouthful about with its tongue, and pushing it out between its lips when it was not palatable. If the same food was continued it would scream and kick violently, exactly like a baby in a passion. About a month after it came into Mr. Wallace's possession, it began to show some signs of learning the use of its legs. When laid on the floor it would push itself along, or roll over, and when left in its cradle would lift itself up into an erect posture, and once or twice succeeded in tumbling out. It did not, however, grow, or gain strength—a circumstance which Mr. Wallace attributes to his being unable to feed it with milk; and it died in a miserable state after being in his possession about three months.

The specimens of the orang-outan which have been brought to Europe have been, for the most part, young individuals. In their general habits, their gentleness and docility, they resemble the chimpanzees; but appear scarcely to be so lively as those animals. Like them, they exhibit a great affection for men, and especially for those who have the care of them; they also sometimes manifest considerable attachment for other animals, especially cats, but appear to entertain a sort of contempt for other monkeys, although they will occasionally condescend to play with them. Like the chimpanzee they learn to sit at table, eat with a knife and fork, drink from a glass, etc.; they sometimes acquire a taste for intoxicating drinks, and under the influence of this have even been known to steal both wine and spirits.

Full-grown specimens do not appear to bear captivity, and indeed their great strength and ferocity render them dangerous. Nevertheless, some of the older travellers, such as Leguat, Bontius, D'Obsonville, and Relian, mention their having seen large specimens in confinement in Java; and some of these, from their size, must have been adult or nearly so. The accounts of these travellers ascribe a wonderful amount of modesty to these apes, especially the females; the last-mentioned writer says that both the male and female "were very bashful when you looked fixedly at them, and the female would then throw herself into the arms of the male and hide her head in his breast. This touching sight I have witnessed with my own eyes."

Of the second species of orang found in Borneo, called *Mias Kassu* by the natives (*Simia Morio* of Professor Owen), Mr. Wallace says that its habits are precisely similar to those of the larger species, from which it is distinguished by the absence of the fatty excrescences on the cheeks, and by the much greater comparative size of the teeth, and especially of the canines in the males. The females of the two species appear to be scarcely distinguishable, except by the difference of size, and by the smaller ones having the two middle incisor teeth in the upper jaw proportionally larger, a character

which also occurs in the smaller males. Mr. Wallace also heard the Dyaks mention a third kind of orang under the name of *Mias Rambî*, which is said to equal the large species in size, but to be destitute of the cheek-excrecences, and clothed with very long hair. Mr. Wallace supposes it to be founded on specimens of the large orang, in which the excrecences have been but little developed. The other described species of the genus *Simia* appear to have been established on insufficient characters.

That we have devoted so much space to the natural history of the preceding large apes—the chimpanzee, the gorilla, and the orang-outan—is to be attributed to the interest which attaches to these creatures, as forming, next to our own species, the highest members of the animal kingdom. This circumstance, and the exaggerated notions frequently entertained of the extent to which these creatures approach man, both in their structure and endowments, have led us to dwell upon them at far greater length than will be necessary in treating of the rest of the Quadrumana, and also to confine ourselves principally to their history in a state of nature, in which, alone, their true character can come freely into play.

THE GIBBONS, or LONG-ARMED APES (Genus *Hylobates*).—The remainder of the true apes all belong to the genus *Hylobates*, the species of which are now commonly known as Gibbons; they are the *Long-armed Apes* of the older writers on zoology. They are all inhabitants of the region of the East Indies—a few living on the continent of Asia, whilst the majority are confined to the islands of the Eastern Archipelago, especially Sumatra, Java, and Borneo.

Pliny's reference to satyrs living in the East Indies is probably founded partly upon the imperfect accounts of gibbons which had reached him. Thus he says, that "Tauron mentions a savage tribe, under the name of *Choromandæ*, which have no speech, but utter horrid screams; they have hairy bodies, fiery eyes, and teeth like dogs;" and adds that "Megasthenes relates that amongst the nomade Indians there is a tribe which, instead of a nose, have only two holes; they have bandy legs, which they can twist about like snakes, and are called *Scyritæ*." Marco Polo states that the inhabitants of Java were in the habit of shaving and embalming the bodies of gibbons, which they then sold as pigmies to the merchants who visited their coast in search of drugs and spices. This was probably done in still more ancient times, and it may have been by such means that the ancients became aware of the existence of these so-called satyrs.

The gibbons have the arms still longer in proportion than the orangs, but, like them, have the hairs of the fore-arm turned up towards the elbow. They have the palms of all the hands naked; the thumbs of the fore-hands are cleft very low down, so that the metacarpal joint of the thumb is not included in the palm of the hand, and the thumbs thus appear to consist of three joints; the first and second toes are more or less united, and this is also sometimes the case with the second and third. The skull is smaller than in the orangs, and the brain is smaller, and presents a greater resemblance to that of the monkeys, and less likeness to that

of man than the same organ in the chimpanzee and orang. The intelligence of these apes is also inferior. A further difference from the other apes is to be found in the presence of callosities upon the buttocks of the gibbons—a character which is of importance as indicating an approach to the monkeys. With one exception—that of the siamang—they appear to be quite destitute of the large sacs appended to the wind-pipe, which occur in the orangs, and also, but rather less developed in the chimpanzee and gorilla, and even in some of the lower monkeys. The number of ribs varies from twelve to fourteen.

The general habits of the gibbons appear to be rather sedentary than otherwise. Their movements are slow; their nature gentle, and rather melancholy; and they do not appear to lose their mildness of disposition so much as the other apes, as they increase in age. They live in troops in the forests, and usually raise a tremendous howling noise in concert in the morning and evening. Of the rather numerous species of gibbons described, we need only refer to a few of the best known. The first species that was accurately described and figured was—

THE WHITE-HANDED GIBBON (*Hylobates Lar*)—the *Grand Gibbon* of Buffon, which was placed by Linnaeus, in the earlier editions of his "Systema Naturæ," in the same genus with the orangs and the human species. This animal, which is between two and three feet in height, is of a uniform black or brownish-black colour, with the exception of the backs of the four hands, and a broad band encircling the face, which are whitish. The black hair of the body and limbs is erect and woolly; the white hair of the hands is coarse, harsh, straight, and depressed. It is an inhabitant of the peninsula of Malacca, of Siam, and probably also of some neighbouring regions. The living specimen observed by Buffon is described by him as being "of a tranquil nature, and of gentle manners. Its movements were neither very lively nor very precipitate. It received gently what was given it to eat; and it was fed on bread, fruit, almonds, etc. It had a great dread of cold and moisture, and did not live long out of its native country."

THE HOOLOC (*Hylobates Hooloc*) is another continental species, found principally in the district of Assam, as far north as the 28th degree of latitude. It is one of the largest species, measuring, when full grown, upwards of four feet in height. It is covered with harsh, shining, black hair, with a broad white or greyish band across the forehead, above the eyebrows.

Their food consists principally of fruits; but they also eat some kinds of grass, and the young shoots and leaves of the peepul and other trees, which they chew, swallow the juice, and then reject the indigestible part. They are said to go in herds of from one hundred to one hundred and fifty individuals, raising a howling noise, which may be heard at a great distance. Dr. Burrough, who forwarded an account of the habits of this species to Dr. Harlan, says that "they are easily tamed, and when first taken, show no disposition to bite, unless provoked to anger, and even then manifest a reluctance to defend themselves, preferring to retreat to some corner rather than to attack their enemy;" but, according

to Mr. Owen, as quoted by Mr. Blyth, they occasionally attack the natives, and bite them severely; and Mr. Owen himself was once surrounded by a troop of them, which he disturbed whilst washing themselves in a stream, and felt convinced that, had he not taken to his heels, they would have attacked him. The same gentleman states that these apes appear to destroy large snakes. His attention was once attracted by the noise made by them in some trees over his head. On stopping to examine into the cause of the uproar, he was disagreeably startled by the sudden fall of a python, six or seven feet in length, which was bitten in many places, and nearly dead.

According to Dr. Burrough the hoolocs walk erect with great ease, balancing themselves by raising their arms above their heads; but if urged to greater speed they drop their hands to the ground, and assist themselves forward, jumping rather than running. If they succeed in making their way to a grove of trees, they swing with such astonishing rapidity from branch to branch and from tree to tree, that they are soon lost in the forest. In confinement they are gentle and tractable, and appear to entertain some affection for their master. In drinking they dip their hands into the liquid and then suck their fingers; but when very thirsty, they will take up the vessel containing their drink with both hands, and carry it to their lips, so as to get a more considerable draught. A specimen in Dr. Burrough's possession was fed principally upon fruits, boiled rice, and bread and milk, but would also eat cooked animal food, especially chicken and fried fish; he rejected beef and pork; he liked eggs, coffee, and chocolate, and was very fond of insects, searching in the crevices for spiders, and if a fly chanced to come within his reach, would dexterously catch it in one hand. Hence we may infer, that insects constitute a portion of the natural food of the hooloc, and probably also of the other gibbons. The cry of the specimen just referred to, was a loud and shrill *whoo-whoo, whoo-whoo*.

The hooloc was considered by Mr. Ogilby to be probably the origin of Pliny's *Seyritæ*, and described by him, in consequence, under the name of *Hylobates Seyritus*.

THE SIAMANG (*Hylobates Syndactylus*) is the largest and most powerful species of the genus, and is entirely of a black colour, with the exception of a few hairs of a reddish tinge upon the eyebrows and chin. The hair is long and coarse, but glossy; the belly is nearly naked, and the throat completely so; it incloses a large sac communicating with the larynx, which can be filled with air at the pleasure of the animal, and when thus distended forms a huge goitre-like swelling of the neck. This sac, which exactly resembles that of the orang-outan, is supposed to assist in augmenting the power of the tremendous voice of this animal; it also indicates an approach, on the part of the siamang, to the higher apes, which, like him, occur in the forests of Sumatra.

The siamang was the first species of gibbon in which the union of the first and second digits of the hinder hands was noticed; and indeed this character is presented by this animal so much more strongly than

in the other species of the genus, that it well deserves the name of *Syndactylus*, applied to it by Sir Stamford Raffles. This peculiarity has even induced Dr. Gray and M. Boitard to propose the formation of a separate genus for its reception.

M. Duvaucel, who discovered this species in the neighbourhood of Benecoolen in Sumatra, states that the siamangs are very common in the forests, where they assemble in numerous troops, led by a chief, whom the Malays believe to be invulnerable, probably because he is more powerful, active, and difficult to get at than the rest. These troops salute the rising and setting sun with the most terrific cries, which may be heard at a distance of several miles, and which, when near, stun those whom they do not frighten. This is the morning call of the mountain Malays, but to the inhabitants of the towns it is a most insupportable annoyance. By way of compensation, they preserve a most profound silence in the daytime, at least if their repose is not disturbed. M. Duvaucel adds, that they are slow and heavy in their gait, so that they may be easily caught when surprised, especially on the ground; but, on the other hand, their vigilance is so great, and their sense of hearing so delicate, that it is by no means an easy matter to surprise them, as at the least noise, even though it be at a mile's distance, they take to flight. On the ground they advance by jerks, using their long arms like crutches. When one of a troop is wounded it is immediately abandoned by the rest, unless it happens to be a young one, when the mother stops, falls with it, and, uttering the most lamentable cries, attacks the enemy with open mouth and extended arms. Under ordinary circumstances also, the females, according to M. Duvaucel, bestow an amount of care upon their offspring which seems almost to belong to a rational sentiment. He says—"It is a curious and interesting spectacle to see the females carry their young to the river, wash their faces in spite of their childish outcries, and altogether bestow upon their cleanliness a time and attention, which, in many cases, the children of our own species might well envy."

In confinement the siamang, according to M. Duvaucel, is gentle, but stupid and sluggish; in fact, from his account it would appear, that the very gentleness of the animal is merely due to its apathy. Mr. George Bennett, however, who obtained a specimen of this animal at Singapore in 1830, has published a far more favourable account of its endowments. Mr. Bennett describes his specimen as always walking erect when on a level surface, sometimes holding his arms down so as to assist himself, by touching the ground with his knuckles occasionally, but more usually raising them over his head, ready to seize a rope and climb up on the approach of danger. This animal preferred vegetable food, and was especially fond of carrots; when these were put upon the table for dinner, the siamang, although usually very decorous in his behaviour, immediately forgot his good manners, and it was not without some difficulty that he could be prevented from attacking them uninvited. "A piece of carrot," says Mr. Bennett, "would draw him from one end of the table to the other, over which he would walk without disturbing a single article, although the ship was

rolling at the time; so admirably can these creatures balance themselves." He would drink tea, coffee, and chocolate, but never acquired a taste for wine or spirits; he was excessively fond of sweet things, and sometimes attempted to lift off the lid of the jar in which some cakes were kept; he would eat animal food, especially fowl; and a lizard having been caught on board was placed before him, when he instantly seized it, and devoured it greedily. This specimen exhibited great attachment to his master, and when first sold to a European owner, made his escape several times, in order to get back to a young Malay who had brought him from Sumatra to Singapore. He exhibited considerable activity in climbing about the rigging of the ship, was greatly irritated when confined or disappointed in any way, and on passing the Cape, finding the temperature too low to allow of his sleeping on the maintop, as had previously been his habit, he showed an eager desire to be taken into his master's arms, and to be permitted to pass the night in the cabin, for which he afterwards evinced such a decided partiality, that, on the ship getting again into warmer latitudes, he would not resume his old station in the maintop, but showed a strong determination to remain where he found himself so comfortable. We cannot quote farther from the interesting account of Mr. Bennett; but the preceding statements will be sufficient to show that the endowments of this animal are far higher than we should be led to believe from the statements of M. Duvaucel.

THE AGILE GIBBON (*Hylobates Agilis*).—The agile gibbon, which is called *Ungka-puti* by the Malays (*Ungka* being apparently a generic name for the gibbons) is, like the siamang, a native of Sumatra, where it was discovered by M. Duvaucel. It is, however, far less numerous in the forests of that island than the siamangs, and is more frequently met with in pairs than in troops. The colours of the agile gibbon are more variegated than those of the preceding species; the head and shoulders, the inside of the arms and legs, and the whole front of the body being of a deep coffee-brown colour; whilst the occiput, the whole of the back, except the shoulders, and the outside of the thighs are pale brownish-white. The sides of the face are adorned with bushy white whiskers, and a narrow white band runs across the forehead above the eyebrows.

M. Duvaucel contrasts the agility of this gibbon with the comparative sluggishness of the siamang as described by him; but it seems probable, from the narratives of other observers, that the difference between these two species in this respect is far less than M. Duvaucel would make it appear. In describing its surprising activity, the French naturalist says—"It escapes like a bird, and like a bird can only be shot, so to speak, flying; scarcely has it perceived the most distant approach of danger when it is already far away. Climbing rapidly to the tops of the trees, it there seizes the most flexible branch, poises itself two or three times to secure its balance and acquire a sufficient impetus, and thus clears, time after time, without effort as without fatigue, spaces of forty feet and upwards." The same writer adds, that although deprived of the guttural sac, so conspicuous in the siamang, its cry

is very nearly the same, so that either this organ does not produce the effect of increasing the sound usually attributed to it, or it is replaced in the present species by some analogous formation. This cry is compared to the syllables *wou-wou*, frequently repeated with peculiar modulations. A somewhat similar cry would appear to be common to most of the gibbons, and several of the species, the present one amongst others, receive the name of *Wou-wou* from the Malays.

One of these is the CINEREOUS GIBBON (*H. Leuciscus*), a native of Java and the Molucca Islands, specimens of which are occasionally brought to Europe. Of the habits of this and the other species in a state of nature, scarcely anything is known; but we may presume that they are very similar to those which we have been describing.

The second group of the Simiadæ, that of the true *Monkeys*, differs from the apes just described by the constant presence of callosities upon the buttocks, and by the almost constant presence of cheek-pouches and a long tail. The arms are never so disproportionate in length as those of the apes; and yet the general structure of the body is much further removed from that of man. In their character, also, the monkeys generally exhibit a great difference from the apes—they are vivacious and petulant in their deportment, and usually very capricious in their temper; presenting in these respects a marked contrast to the grave and somewhat melancholy nature of the species previously described. It is in the East Indies, in the same region inhabited by the oranges and the gibbons, that we find those monkeys which are most distinguished from the rest of their tribe by ape-like characters; though even here we meet with species of a more animal type, and resembling their African brethren; whilst the great majority of the latter present a wider divergence from the apes, and gradually approach the baboons.

THE HOONUMAN (*Semnopithecus Entellus*).—The Indian monkeys above alluded to form the genus *Semnopithecus* of F. Cuvier, which is characterized by the slender form and long limbs and tail of the species, by the want of cheek-pouches, and by the presence of thumbs on the fore-hands. The canines of these monkeys are but slightly developed, and the molars have their tubercles so arranged as to form transverse ridges—a structure which indicates that the animals rather feed upon the leaves and tender shoots of plants than upon fruits; and this is also shown by the structure of the stomach, which is very long and much dilated in parts, especially at the anterior end into which the œsophagus or gullet opens. These dilated portions being separated by constrictions, the stomach acquires a complicated appearance, somewhat resembling that of the ruminant quadrupeds. It is a remarkable fact in connection with this peculiarity of structure, that the stomachs of these monkeys often contain *bezoars*, or concretions of a similar nature to those found in many Ruminants, and which are so highly prized by eastern nations. The monkey bezoars are said to be of more value than those obtained from the Ruminants.

The hoonuman, which is for many reasons one of the most interesting species of this group, is a large

monkey—the old males measuring nearly five feet in height—of a yellowish or greyish-white colour, darker on the back, limbs, and tail, and with the face and hands black. The hair above the eyebrows forms a sort of projecting fillet across the front of the head; the face is bordered on each side with light whiskers, and the chin is furnished with a beard, which is peaked and directed forwards. As the animals increase in age the fur becomes darker, until it is of a nearly uniform rusty brown colour.

The hoonuman is an exceedingly abundant monkey in India, especially in Bengal. During the summer it migrates northwards into the hills, travelling as far as Nepal, and even to the elevated plain of Boutan. It is regarded with great veneration by the Hindoos, who have even deified it, and assigned it a high place in their almost innumerable multitude of gods. They look upon the destruction of a hoonuman with the greatest horror, and believe that the perpetrator of such a crime will certainly die within a year after its commission. M. Duvaucel, from whom we have already quoted, gives an amusing account of the difficulty which he experienced in obtaining specimens, in consequence of this superstitious feeling. As soon as he was seen abroad with his gun, he was surrounded by crowds of natives, who employed themselves assiduously in chasing the monkeys out of gunshot; and during a whole month that a small family of hoonumans remained at Chandernagore, where he was residing, his house was constantly surrounded by Brahmins, who tormented him by incessantly beating tom-toms and drums to scare the four-handed divinities from so dangerous a neighbourhood. On entering the holy city of Goalpara, he saw the trees everywhere covered with these long-tailed deities, which immediately fled with loud cries, whilst a dozen Hindoos surrounded the traveller and endeavoured to impress upon him the danger he would incur by molesting or injuring animals which were nothing less than metamorphosed princes and heroes. Passing on, however, he says he met a princess so seductive that he could not resist the temptation of cultivating a nearer acquaintance with her. He levelled his gun and fired; but then, to quote his own words, he “became witness of a scene which was truly touching and pathetic. The poor animal, which had a young one on her back, had been hit near the heart; feeling herself mortally wounded, she collected all her remaining force for the effort, seized her young one, and was just able to throw it up into the branches of a neighbouring tree, before she fell and expired at his feet. An incident so touching,” adds M. Duvaucel, “made a greater impression on me than all the discourses of the Brahmins; and the pleasure of obtaining a specimen of so beautiful an animal, was, for once, incapable of contending against the regret which I felt for having killed a creature which appeared to be bound to life only by the most estimable and praiseworthy feelings.”

As might be anticipated, these monkeys, being protected from all injury by the superstitions of the inhabitants, abound to such an extent, and feel so little fear of man, that they become a positive nuisance to those whose minds are not so constituted as to enable them to regard the hoonuman in the light of a divinity.

They take up their abode in the topes or groves of trees which the Hindoos plant around their villages, and are often so numerous in the towns that Sir James Forbes considered that in Dhuboy there were more monkeys than human inhabitants. They visit the houses of the natives, who willingly provide them with food; and in the villages they often plunder the peasants, who, however, regard their visits as a high honour. At Dhuboy, according to Forbes, the roofs of the houses seemed to be entirely appropriated to the accommodation of the monkeys, and the same writer gives a ludicrous account of his having been compelled to remove from a shady verandah, in consequence of the pertinacious pelting administered to him with fragments of tiles and mortar from the roof of an opposite house by these animals. He also describes a curious mode of revenge sometimes adopted by the Hindoos of that town, in which the hoonumans are the principal agents. It appears that before the commencement of the rains, about the middle of June, it is usual to turn all the tiles on the roofs of the houses. The tiles are not fixed with mortar, but accurately adjusted one over the other, so that, if this operation is performed just before the setting in of the rains, the roof will be watertight during the wet season, and afterwards a few gaps are of little consequence. It is at this period, when the tiles have been turned and the first rains are hourly expected, that the Hindoo who has a grudge to gratify repairs at night to the house of his adversary, and strews a quantity of grain over the roof. This is soon discovered by the monkeys, who assemble in great numbers to pick up their favourite food; and, as much of the grain naturally falls between the tiles, they soon nearly unroof the house in their efforts to get at it.

In other respects they appear to be exceedingly mischievous and destructive. They often descend in troops upon the cultivated fields; and it is said that when the troop is pretty numerous, they will strip a maize field of moderate size in a few hours. The disposition of the males, also, is described as so libidinous, that it is not safe for a woman to pass their haunts. The only return they make for all the damage they do, and all the kindness shown them by the natives, is that, according to Forbes, they frequently destroy poisonous snakes. They seize them by the neck when asleep, and then, “running to the nearest flat stone, grind down the head by a strong friction on the surface, frequently looking at it, and grinning at their progress. When convinced that the venomous fangs are destroyed, they toss the reptile to their young ones to play with, and seem to rejoice in the destruction of the common enemy.” The tigers and other carnivorous quadrupeds of India, having no such scruples as those of the human inhabitants of the country, are said to wage a constant war with the hoonumans. The tiger is described as taking up a position at the foot of the tree in which the monkeys have taken refuge, when his roaring so frightens them that they tumble down and he devours them at his leisure.

The cause of the veneration in which the hoonuman is held by the Hindoos, which, indeed, is also extended, although in a less degree, to other monkeys, is doubtless partly to be ascribed to the Brahminical doctrine

of metempsychosis, but probably still more to its supposed derivation from one of the personages of their mythical history. In the great epic poem of the "Ramayan," which is devoted to the exploits of Rama, an incarnation of Vishnu, that hero contracts an alliance with Hoonuman, king of the monkeys, in his war with the Rakshasas of Ceylon. Throughout the war Hoonuman plays the principal part, next to Rama himself; but having stolen a mango-tree from a garden in Ceylon for the purpose of giving it to the Hindoos, he was condemned to have his face and hands blackened, a mark of disgrace which his descendants continue to bear to the present day. According to another account, Hoonuman was condemned to be burned by the giant from whom he stole the mango, but escaped with no greater injury than the singeing of his face and hands. We learn also that Hoonuman endeavoured to set Ceylon on fire, by means of a lighted tar-barrel tied to his tail; but, finding unexpectedly that this appendage was not fire-proof, he hastened to the Himalayas and dipped it into a lake at the source of the Ganges, which bears the name of Bhunderpouch or "Monkey's tail" to this day. The Hindoos believe that every year a single monkey is sent by his fellows to take his station on the snowy peak of a mountain which rises from the sacred lake, and there keeps watch until he is relieved from his severe duty in the following season.

THE DOUC (*Semnopithecus Nemæus*).—The douc or Cochin China monkey is remarkable in this family for its vivid and varied colours. It has the face naked and yellowish; the top of the head, and the whole of the back and sides, grey; the shoulders and thighs, as well as the hands and feet, black; the arms white; and the legs deep chestnut. The face is surrounded by white whiskers, and the tail and a patch on the rump are also white, contrasting curiously with the darker fur in the vicinity.

This beautiful monkey, which attains a height of upwards of four feet, is a native of Cochin China, where it occurs in great abundance in the forests; but from the little commerce carried on with that country, scarcely anything is known of its habits, and specimens are even rare in our museums. It was long regarded as the type of a distinct genus, characterized by the absence of callosities, which, however, it is now found to possess. The error arose from the circumstance that Buffon, who first described the species, had only a badly-stuffed specimen, in which the skin had been allowed to shrink, so as to conceal the callosities.

THE BUDENG—(*Semnopithecus Maurus*)—an inhabitant of Java and Sumatra, presents a remarkable contrast to the preceding species in the uniform black colour of its long silky hair. The young animals are reddish-brown. A frill of upright hair runs across the forehead, and the cheeks are adorned with a pair of large pointed whiskers, directed backwards. This species is said by Dr. Horsfield to be exceedingly abundant in the forests of Java, where it lives in the trees, in troops of fifty or more. It would appear, from the statements of the same author, that it is hardly safe to approach them in the forests, not from any danger of an attack, but because the commotion

produced in the troop by the sight of a man often causes them to break off the dead branches of the trees, which are then precipitated on the spectator. The natives often hunt them for the sake of their fur, when they kill them with sticks and stones. This species is also called *Lutung* or *Lotong*, especially in Sumatra; according to Dr. Horsfield its name in Java is *Budeng*, and another monkey is known as the *Lutung*, although the budeng is also sometimes called *Lutung Itam*, or Black *Lutung*, the second species being denominated *Lutung Mera*, or Red *Lutung*. The latter (*S. Pyrrhus*) is comparatively rare, and is a great favourite with the natives, who keep it as a pet about their houses. Of the other species of *Semnopithecus* very little is known; they are rather numerous, and inhabit the same countries as the preceding.

THE KAHAU, or PROBOSCIS MONKEY (*Nasalis Larvatus*).—Plate 1, fig. 3.—This curious monkey agrees very closely with the *Semnopithecus* in its general characters, but differs from them in the singular form of the nose, which, in the male especially, looks like an absurd caricature of that prominent and important member in the human countenance. It is principally from this circumstance that the kahau has been regarded as constituting a distinct genus.

The nose in the male forms a curved fleshy proboscis; in the female it is much smaller, and terminates in a sharp point, from which it slopes directly to the upper lip. The nostrils in both sexes are placed on the inferior surface. The tail, as in the preceding monkeys, is very long; the hair is of a reddish tawny or chestnut colour all over the body, paler in front; and the loins in the male are marked with pale spots. The face, which is naked, is described by some authors as of a bluish colour; but Mr. A. Adams states, that in a live female examined by him it was of a bright brick-dust red. The hair of the chin, neck, and shoulders is longer than that on the other parts of the body, producing somewhat the appearance of a mane.

The kahau is a large monkey, the adult males often measuring four feet and a half in height when in an erect posture. It is a native of Borneo, where it lives in numerous troops upon the trees in the neighbourhood of rivers, and is said to move amongst the branches in a more deliberate fashion than most other monkeys. According to the old Dutch naturalist, Wurmb, however, the kahau would appear to exhibit more activity in the morning and evening at least, when, he says, they may be seen "leaping with astonishing force and rapidity from one tree or branch to another, at the distance of fifteen or twenty feet." He adds that the natives will have it, that, when thus occupied, the monkeys hold their noses in their hands, doubtless from a fear lest so ornamental an appendage should meet with some injury; but this, he says, he has never seen. When disturbed, it emits a short, impatient cry, described by Mr. Adams as something "between a sneeze and a scream, like that of a spoilt and passionate child;" other accounts compare this cry to the word *kahan*, whence is derived the name usually applied to the animal. It would appear, however, that its true native name is *Banta-jan*. It is described as a fierce and violent animal.

The kahau is only known to inhabit the great island of Borneo, where the Dyaks assert that these monkeys are men who have retired into the woods to escape taxation. How they subsequently became ornamented with tails does not appear. The species is also said to occur in Sumatra, the peninsula of Malacca, and Cochin China. From the statement of M. Geoffroy St. Hilaire, —that the ambassadors sent by Tippoo Sahib to Paris, just before the French revolution of 1789, recognized the stuffed specimen in the museum there as an animal of their country to which they ascribed a high, moral, and intellectual character—it would appear, also, that this, or a similar species, should occur in Hindostan proper. None of these localities, however, rest upon any sufficient testimony; and in the case of Tippoo's ambassadors, it seems probable that they may either have seen specimens brought as captives from the far east, or that they may have confounded this monkey with the hoonuman.

THE GUEREZA (*Colobus Guereza*).—Although the majority of the African monkeys belong to a group presenting well-marked differences from the Indian species above described, there are, nevertheless, some of them which exhibit a close resemblance to the Semnopithecæ, both in structure, character, and mode of life, and may be regarded as the African representatives of the Asiatic group which has hitherto occupied our attention. The stomach has the same sacculated structure; the dentition is identical, and the molar teeth are found to be worn down by use, indicating that the creatures live upon the leaves and buds of trees, rather than upon fruits; the cheek-pouches are wanting, the body and limbs are slender, and the tail long. The Colobi are, however, distinguished from their Indian relatives, and, indeed, from all other monkeys of the Old World, by a most important character, namely, the total absence or rudimentary condition of the thumbs on the anterior members; in most cases the metacarpal bone of the thumb is alone present, and in those species in which this is followed by a single small joint, the only external indication of a thumb is a mere tubercle, of not the least service in prehension.

The guereza is the only species of this group upon whose habits we have any information. It is about the size of a cat, and of a deep black colour, with the cheeks, throat, and sides of the neck white, and with a large quantity of long white hairs, growing from the shoulders, sides, and rump, and hanging down in such a manner as to conceal the whole lower part of the body. The extremity of the tail is, in like manner, concealed by long white hairs.

This beautiful monkey, which is a native of Abyssinia, was mentioned by the old traveller Ludolf, who supposes it to have been the *Callithrix* of the ancients, a conjecture which seems very probable from the description of that animal given by Pliny. Ludolf says that it is called *Foukes* in Ethiopic, and *Guereza* in the Amharic dialect, and these two names are given with some variation by later travellers.

Dr. Rüppell, who first accurately described the guereza, informs us that it resides in small families in the loftiest trees, and usually in the neighbourhood of some stream. It is restless and lively in its habits,

but not noisy; its food consists of wild fruits, seeds, and insects; and, unlike the ordinary monkeys, it never commits any depredations upon the cultivated grounds. In allusion to its harmless nature, and to the constant persecution to which it is subject, for a reason which will be hereafter mentioned, Ludolf says that a curious rhyme is current in some parts of Abyssinia, which may be translated as follows:—

“I give no man pain—
I eat no man's grain—
They hate me in vain!”

The same traveller notices the tenderness of constitution of this monkey, which is confirmed by other observers, from whose narratives it would appear that the guereza will not endure confinement, but pines to death in captivity in the course of a few days.

The fur of this animal is much prized in Abyssinia on account of its beauty; and in the provinces of Damot and Gojam, where the guerezas abound, they are destroyed in great numbers for the sake of their skins, which, according to Dr. Rüppell, fetch as much as five shillings each in the market of Gondar. Mr. Salt places the value rather lower, saying that they sell for about half a dollar. They are chiefly employed in ornamenting the shields of the native soldiers; and the distinguished traveller last quoted, states that every man in Tigré wears a piece of this skin as an ornament on his shield. The skins are also sometimes sewn together, when they form a beautiful covering for a couch, but their cost prevents their being put to this use by any but the chiefs.

Several other monkeys of this genus are found in the tropical regions of Africa, especially on the western coast, whence the skins of some long-haired black species are imported into Europe, and used in the manufacture of muffs. There is much uncertainty as to the number of species, about half a dozen having been described, which are considered by some authors as simple varieties of one or two. This is owing in a great measure to the imperfect condition of the skins which reach this country. They are highly prized by the Negroes, who make caps of them, and will pay from twenty to thirty shillings apiece for them; and as it is only the skin of the body that is valuable as a fur, the hunters never take the trouble of skinning the head and legs.

The great majority of the African monkeys belong to the group called *Guenons* by French authors, forming the genus *CERCOPITHECUS* of zoologists. These monkeys have the face somewhat produced into a muzzle, but rounded at the extremity; cheek-pouches are always present; the eyes are prominent, not shaded by projecting eyebrows; and the tail is long, usually longer than the body. They are distinguished from a nearly-allied group—that of the *Macaques*, all the species of which are inhabitants of tropical Asia—by the last molar in the lower jaw having only four tubercles on its surface; whilst in all the remaining monkeys and in the baboons, this molar exhibits one or two additional small tubercles at its posterior portion. In all these monkeys the canines of the upper jaw are greatly developed, especially in the males, in

which they acquire a formidable length as compared with the size of the animal; and from their being acute at the point, and very sharp along the hinder edge, they constitute most dangerous weapons, which the old males of most species know well how to use.

Besides the presence of cheek-pouches, the Cercopithecæ present another character of distinction from the Indian Semnopithecæ and the African Colobi, which, although of secondary importance, and common to them and many of the macaques and baboons, it is still necessary to mention. This is the annulated nature of the fur, arising from the individual hairs not being of the same colour from the root to the tip, but marked with rings of different colours, by which means the fur acquires a minutely speckled appearance; and the general tint of the animal is usually quite different from any of the distinct colours which are to be found in its fur.

In their structure and form, as in their character, these animals may be regarded as the types of our notion of a monkey; they are nearly equally removed from the apes on the one hand, and from the baboons on the other. Unlike the mild and gentle Semnopithecæ and Colobi, they are petulant, capricious, and often spiteful, especially when old; whilst on the other hand they are, for the most part, free from the sullenness and moroseness which are usually characteristic of the baboons. They live in the forests, each species usually confining itself to some particular district, where the animals live in large troops, under the chieftainship of the old males; and the inroads of one species or tribe upon the region over which another has arrogated the dominion to itself, are highly resented by the latter, of which the whole community immediately unites to repel the aggression. Even in confinement this party feeling is maintained; and it is not uncommon in large menageries, where numerous monkeys of different kinds are kept in the same cage, to see those of one species combine their powers to defend one of their brethren against the bullying of some larger occupant of their common prison. In their native forests, these monkeys keep at a distance from human habitations, and usually frequent the banks of streams. They feed principally upon fruits and seeds, but also eat the buds and young shoots of trees, and occasionally diversify this vegetable diet with a repast of birds' eggs or insects, although they appear to be less addicted to animal food than the baboons.

The genus *Cercopithecus* includes those monkeys of the Old World which are most commonly brought to Europe, and also those which have most frequently produced young ones in our menageries. The female, under these circumstances, carries the young one in her arms until it has acquired strength enough to cling firmly to her hair, when, having all her hands at liberty, she is able to spring and climb about with as much activity as if she had no burden. The male is sometimes, if not always, an exceedingly bad father, quarrelling with the female, and ill-treating the young one. M. Is. Geoffroy St. Hilaire, mentions, that in 1837, when a female of the *Griwet* (*C. Griseus*) had a young one in the Jardin des Plantes at Paris, the male was obliged to be removed, in consequence of his

unnatural behaviour to his infant offspring; while, in the very next cage, several male baboons were to be seen surrounding two females with their young ones, caressing the two mothers with the most lively demonstrations of tenderness, pressing them in their arms, embracing them almost like human beings, and quarrelling amongst themselves for the pleasure of nursing the little ones, which, after passing from arm to arm, were faithfully returned, each to its own mother."

Of the numerous species of this genus known to naturalists, we can only mention a few. Amongst these—

THE TALAPOIN (*Cercopithecus Talapoin*) is the one which, in the gentleness of its disposition and the slenderness of its form, would appear to approach most closely to the preceding monkeys; it has been separated by Geoffroy as a distinct genus, on account of the large development of its brain, the shortness of its muzzle, and especially the small size of its hinder molars, of which those of the lower jaw have only three tubercles.

The talapoin is the smallest of the monkeys of the Old World. Its fur is of a greenish tint, with the lower surface of the body and the inside of the limbs greyish-white; the hairs of the forehead are raised, so as to form a sort of tuft; the whiskers are yellowish, and the face flesh-coloured, with the nose and ears dark-brown or black. It is a native of Western Africa, but is less commonly brought into Europe than many other species inhabiting the same locality, although its gentleness and intelligence render it one of the most interesting of the Old World monkeys. In captivity it is very lively and amusing.

THE MONE (*Cercopithecus Mona*) is a species nearly related to the talapoin, which it resembles in the elegance of its form, and in its intelligence. It is a little larger than the talapoin, but is still one of the smallest of the Simiadae, and its colours are very beautiful. The head is of an olive-green colour, mixed with golden-yellow; the forehead is covered with whitish hairs, and on each side of the face is a large bushy whisker of a straw colour; the back and sides are brilliant chestnut, mottled with black; the legs and tail are black, speckled with grey, and on each hip, immediately in front of the root of the tail, is an oval spot of the purest white—a character which is peculiar to this species; the throat, the lower part of the body, and the inner surface of the limbs, are also pure white.

The mone inhabits the western coast of Africa, and is usually brought to Europe from Senegal. Its name of *Mona* is a sort of generic name for monkey in some parts of the south of Europe, and was applied to this species by Buffon, who also identified it with the *Cebus* of the ancients, although without sufficient reason. In confinement it exhibits a remarkable amount of amiability, being more docile and less petulant and capricious than most other monkeys, so that it may be allowed far more liberty, although the males not unfrequently change their character for the worse as they increase in age. M. F. Cuvier has published an interesting account of an individual of this species, which lived from its youth upwards in the menagerie at Paris,

and preserved its gentleness even after it had arrived at maturity. This specimen exhibited wonderful address in getting at any object that pleased him; he would open cupboard doors by turning their keys, or undo knots, and had acquired an adroitness in pocket-picking that would have done credit to a pupil of Mr. Fagin, performing this operation with so much delicacy that his hand could not be felt, although the person whose pockets were under examination might be perfectly aware of what was going on.

THE DIANA MONKEY (*Cercopithecus Diana*) which is said to be called the *Roloway* on the Gold Coast, and *Exquima* in Congo, is a larger and stouter species than either of the preceding, but is still distinguished amongst the monkeys of this genus by the elegance of its form, and the gentleness and playfulness of its character. Its general colour is a mixture of black and grey, with the face, the hands, and the extremity of the tail deep black; down the back runs a broad band of a deep chestnut-red colour; on the forehead there is a white band, curved so as to form a very open crescent—a character which induced Linnæus to give the species the name of the goddess of the chase; and the whiskers and beard are also pure white. The latter appendage forms one of the most curious characters of this monkey; it is very long and pointed, resembling, as Mr. Ogilby says, “the formal cut of the peaked beard which we see in some old paintings about the time of Henry VIII.,” and the monkey appears to regard it as highly ornamental, taking great care to keep it trimmed and neat, and holding it in his hand when he is about to drink, to prevent it from coming in contact with the water. Mr. Ogilby says that the first time he observed this strange action, the ludicrous effect of the creature’s solicitude about his beard made him laugh outright; the monkey, after looking up for a moment as if in astonishment at this sudden explosion, appeared all at once to discover its cause, and no doubt regarding it as a personal insult, flew at the offender most viciously, and was only prevented by the shortness of his chain from inflicting a severe and summary punishment upon him.

As a general rule, however, the diana monkey is exceedingly good-tempered, and very lively and playful. A most interesting account of a specimen of this species was communicated by Mrs. Bowdich to *Loudon’s Magazine of Natural History*, vol. ii. This monkey, which had received the name of Jack, belonged to the cook of the ship in which Mrs. Bowdich returned from Africa. Teasing was one of his principal accomplishments, and he seems to have brought the art to a great state of perfection. He would pull off the men’s caps and throw them into the sea, a habit which is said to be common in nautical monkeys; he would knock over the parrot’s cage for the pleasure of drinking the water as it trickled along the deck, steal the tea out of the sailors’ mugs, or abstract the pieces of biscuit which the men had put between the bars of the grate to toast, and carry off the carpenter’s tools. But his favourite amusement consisted in riding the pigs, in which he was a great adept. “Whenever the pigs were let out to take a run on deck,” says Mrs. Bowdich, “he took his station

behind a eask, whence he leaped on the back of one of his steeds as it passed. Of course the speed was increased, and the nails he stuck in to keep himself on produced a squeaking; but Jack was never thrown, and became so fond of the exercise that he was obliged to be shut up whenever the pigs were at liberty.” Several smaller monkeys were on board the ship, and of these he was very jealous, going so far as actually to throw two of them into the sea. On a third he exercised his spite in a most ludicrous fashion. The sailors had been painting the ship’s side with a streak of white, and on going down to dinner left their paint and brushes on deck. This excellent opportunity was not lost upon Jack; he called a little black monkey to him, and when the poor little beast came and crouched at the feet of his superior, the latter seized him by the nape of the neck, dipped the brush into the paint, and immediately covered his victim with white from head to foot. This absurd spectacle caused Mrs. Bowdich and the steersman, who had both been watching his proceedings, to burst into a laugh, upon which Jack dropped the whitened monkey and scampered up into the rigging, whilst the unhappy little subject of this practical joke began licking himself, and was only preserved from being poisoned by a thorough washing with turpentine. During this operation, the author of the mischief was peeping down through the bars of the maintop, with evident enjoyment of the commotion that he had occasioned. Fear of punishment, however, kept him aloft for three days, until hunger compelled him to come down, when he dropped suddenly into Mrs. Bowdich’s lap, as if to seek for protection. The skin of the diana monkey forms a beautiful fur, and is frequently used for that purpose.

THE WHITE-NOSED MONKEYS (*Cercopithecus Nitens* and *Petaurista*), which are also nearly related to the mone, and inhabit the same countries, are distinguished by having a large white spot upon the nose. The best known of these is the Lesser White-nosed monkey (*C. Petaurista*), which is one of the quietest and most playful species of the group; and from its familiarity and amusing habits is always a great favourite with the visitors to our menageries.

THE CALLITHRIX (*Cercopithecus Sabæus*), so called because Buffon supposed it to be identical with the Callithrix of the ancients, belongs to a section of the genus in which the form is more robust, and the character generally far less amiable, than in the preceding species. It is also called the Green monkey, and the Cape de Verd monkey, the latter name indicating one of its dwelling-places; it also occurs in Senegal. It is a handsome species, about the size of a large cat; the fur of the back and sides is of an olive-green colour, mixed with brown, that of the belly is yellow, and the whiskers are yellowish. It is very hardy, and is consequently common in menageries, where its restless playfulness renders it attractive; but its temper becomes uncertain as it grows older, and the adult males are often very spiteful.

THE GRIVET (*Cercopithecus Griseus*) is a nearly-allied, but smaller species, which is also frequently imported into Europe. It is a native of Nubia and of several provinces of Abyssinia, where it is a favourite

with the inhabitants, who often keep specimens in their houses. The grivet was also well known to the ancient Egyptians, and is often represented on their monuments.

THE PATAS (*Cercopithecus Ruber*), an inhabitant of Senegal on the west coast of Africa, is one of the monkeys most commonly imported into Europe. It is about the size of the callithrix, and of a general reddish fawn colour, with the lower part of the body and the inner surface of the limbs pale grey. Across the forehead there is a blackish band, and the extremity of the nose is covered with very short black hairs. In confinement the patas resembles the two preceding species in its character, being very lively and playful, but at the same time so capricious in its temper that any approach to familiarity with it is attended with danger. In a state of nature, according to the old French traveller Brue, the patas possesses a great share of curiosity, coming down from the tops of the trees to the lower branches to examine the boats passing beneath them; but when the first novelty wore off, the monkeys, says he, "became more confident, and began to pelt us with rotten branches and other missiles, not always of the most delicate description." This compliment being returned by the sailors with their guns, by which some of the monkeys were killed and others wounded, they did not allow themselves at first to be intimidated, but renewed the assault with great determination, until finally perceiving that the odds were against them, they scampered nimbly out of range of the guns, and afterwards contemplated the boats from a safer distance.

THE NISNAS (*C. Pyrrhonotus*), is a species very nearly allied to the patas, with which it was formerly confounded. It is, however, a stouter animal, and presents several distinctive characters, especially the whiteness of a portion of the nose. The nisnas is a native of Abyssinia and Nubia; it was well known to the ancient Egyptians, and is often represented in their sculptures. It is also supposed to be the *eebus* of the Greek writers on natural history.

The group of the Macaques, already referred to as distinguished from the Cercopithecæ by the presence of an additional (fifth) tubercle on the hindmost molar teeth in the lower jaw, nevertheless presents a close resemblance to the preceding group in its general characters. In fact, the characters of the species of these groups shade so gradually into each other—the Cercopithecæ becoming insensibly macaque-like, and the macaques baboon-like in their general structure—that some writers have proposed the abolition of the group of the macaques altogether, by uniting the more monkey-like macaques with the Cercopithecæ, and the more baboon-like species with the baboons. At the same time, as the macaques, with but two or three exceptions, are all inhabitants of Asia, where they well represent both the Cercopithecæ and baboons of Africa, it seems desirable to retain the group on account of its convenience in regard to zoological geography.

The macaques are, in general, of a more robust form than the other monkeys; the muzzle is prominent, but rounded off at the extremity, and the tail is very variable in length, being sometimes as long as in many

Cercopithecæ, sometimes reduced to a mere tubercle, and in two species altogether wanting. In their general habits they resemble the Cercopithecæ, but their evil passions acquire a strength proportioned to their usually larger size and greater physical power; and although they are less disgusting and ferocious than the baboons, they are far more so than the other monkeys.

THE SOOTY MANGABEY, or **WHITE-EYELID MONKEY** (*Cereoebus Fuliginosus*). We have already stated, that although the macaques are strictly speaking an Asiatic group, they have a few representatives elsewhere. Amongst these are the mangabeys or white-eyelid monkeys which inhabit Africa, and most closely resemble the common monkeys of that continent in their general form, in the length of the tail, and in their habits. The mangabeys are, however, distinguished from the ordinary monkeys and from the other macaques, by a peculiarity in the structure of the hands—all the fingers both of the fore and hind hands being united by webs which extend at least as far as the first joint, whilst between the first and second fingers of the hinder hands, the web reaches nearly to the tip. They are also characterized by the dead white colour of the upper eyelids, which gives them a singular aspect when brought into view by those perpetual blinkings in which all monkeys are fond of indulging.

The sooty mangabey, which is the commonest species, is of a sooty grey colour on all the upper parts of the body, the tail and the outer surface of the limbs; the chin and throat, and the lower parts of the body are brownish ash colour. This monkey is a native of the west coast of Africa, but nothing is known of its habits in a state of nature. In captivity it is familiar and gentle, exceedingly active and full of grimace, throwing itself into such ludicrous attitudes that, as M. F. Cuvier observes, "it might be supposed to be provided with a greater number of joints than other monkeys," or tumbling and dancing in an absurd fashion to attract the attention of the visitors, from whom it hopes to obtain a reward for its agility. Mr. Ogilby mentions that a "specimen in the menagerie of the Zoological Society was very fond of being caressed, and would examine the hands of his friends with the greatest gentleness and gravity, trying to pick out the little hairs, and all the while expressing his satisfaction by smacking his lips, and uttering a low suppressed grunt." This habit appears to be a favourite one with the species, as many specimens exhibit it.

Two other species of these monkeys are known—the **COLLARED MANGABEY** (*Cereoebus Collaris*), and the **WHITE-CROWNED MANGABEY** (*C. Æthiops*); they are both said to inhabit the west coast of Africa.

THE BONNET MONKEY (*Macacus Sinicus*), the *Toque* of some authors, was called the *Bonnet Chinois* by Buffon, from an erroneous notion that it was a native of China; it is now known to come from the Malabar and Coromandel coasts, and probably inhabits the whole southern extremity of the peninsula of Hindostan. It also lives in a wild state in the Mauritius, but has been introduced into that island since its occupation by Europeans.

The bonnet monkey is a species frequently brought to Europe for exhibition; it is about the size of a large

cat, of a greenish-dun colour on the upper parts and greyish below, and has a long tail. The whole of the face is naked, wrinkled, and of a dingy flesh colour; but the most striking character of the species is to be found in the arrangement of the hair of the crown, which is long and dark-coloured, and instead of standing erect, spreads in all directions like rays proceeding from a common centre, lying upon the surface of the head in the same way as the hair of a scalp wig. It is from this character that the animal has received the name of the bonnet monkey. A somewhat similar disposition of the hair occurs in a nearly allied species, the *Crowned Monkey* (*Macacus Pileatus*), but this is of a reddish-brown colour, and the hair of the head is nearly erect. In its native country the bonnet monkey meets with an amount of veneration almost equal to that shown in Bengal to the hoonuman (see p. 27); although very destructive in the gardens and fields, it is forbidden to kill them, and the natives assemble round any person guilty of this offence, and give him no peace until he has paid for a sumptuous funeral for his victim. Such at least is the account given by Buchanan of the state of matters in Mysore, which, in all probability, relates to this monkey; and that traveller adds, that the proprietors of gardens used to hire men of a particular class, who captured the monkeys and squirrels (which, it would appear, are equally sacred) in nets, and then conveyed them to some distant village; but as everybody resorted to the same means of getting rid of such troublesome neighbours, the gardeners soon found that the monkey-catchers were the only people who benefited by these proceedings, and accordingly gave them up.

In confinement, the bonnet monkey is a most amusing fellow when young, as all his actions are performed with an amount of gravity which is exceedingly ludicrous. Of all the species usually kept in our menageries, the bonnet monkeys exhibit the most striking external marks of mutual affection. When two or three are kept together they are constantly to be seen hugging or nursing each other, or carefully searching in the fur of their companions for the fleas and other vermin which doubtless harbour there in sufficient abundance to render their destruction a matter of gratification. At all events this appears to be the feeling of the monkeys, who make it an affair of mutual advantage; for whilst one fellow exhibits the most exemplary patience, lying at full length, and submitting to have every part of his fur investigated by the sharp nails and sharper eyes of his companion—the latter rewards himself for his trouble by immediately devouring any of his friend's troublesome guests that may come under his fingers. Where a specimen of this monkey has none of its own species to contract an intimacy with, it will content itself with some other animal, and a kitten is not unfrequently given to it as a companion. Under these circumstances, as Mr. Ogilby remarks, "nothing can exceed the ridiculous caricature of humanity which it presents—petting, nursing, and hugging the unfortunate kitten, at the imminent risk of choking it, with all the gravity and fondness" of a child similarly employed. When adult, however, the deportment of the bonnet monkey becomes entirely changed; instead of the playful good temper of the young animals, the old

males exhibit a morose, sullen, and spiteful disposition, which renders it dangerous to attempt any familiarities with them, and the aspect of the animal changes at the same time, and acquires a ferocity which accords but too well with his temper.

THE MACAQUE (*Macacus Cynomolgus*) is another long-tailed species which is also frequently brought to Europe. It is a larger and more robust species than the bonnet monkey, which it resembles in most of its structural characters, and in its disposition. The colour of the upper parts of the body and the outer surface of the limbs is greenish-brown, the lower surface and the inside of the limbs are greyish-white. The tail, when not injured, is about as long as the body; but the macaque has a curious habit of gnawing the end of his tail, and it is a very common circumstance to see specimens with this member considerably abbreviated, most probably in this way. The hair of the crown of the head usually forms a sort of ridge, or crest, running from back to front, and appearing as though it had all been brushed up towards the middle. A specimen which exhibited this peculiarity was described by Buffon under the name of the *Aigrette*.

The macaque is far more widely distributed than the bonnet monkey, being found not only on the continent of India, but also on several of the large islands, especially Java, Sumatra, Borneo, and Celebes. According to Dr. Horsfield, it is the commonest monkey in the forests of Java, where it is a great favourite with the natives, who constantly domesticate it and keep it in their stables, under the impression that its society is advantageous to the horses. In the European menageries the macaque appears to thrive; it supports the severity of our winters better than most other monkeys, and has been several times known to breed in Europe. It is remarkable that, under these circumstances the female has generally deserted her offspring, although other nearly-allied species have not only bred in confinement, but have tended their young with the greatest care. The habits of this animal in captivity are similar to those of the bonnet monkey, but the old males become even more ferocious and spiteful.

THE WANDEROO (*Macacus Silenus*) is one of those species of macaques in which the tail is only about a third of the length of the body. It measures from three feet to three feet and a half in height, and is of a robust form; its hair is of a black or blackish colour, as is also the naked skin of its face and paws, but its head is surrounded by a long thick mane of greyish hair, resembling an enormous wig falling down upon the shoulders, in the style of that remarkable head-dress which is still thought to confer such dignity upon our judges, and perhaps justly, for between this ornament and the habitual gravity of its countenance, the wanderoo acquires a singular air of wisdom and importance, which, in the monkey at any rate, is exceedingly ludicrous. Its tail is tufted at the extremity.

The name of *Wanderoo*, commonly given to this monkey, is said to be its ordinary denomination in Ceylon, of which island, and the adjacent coasts of continental India, it is an inhabitant. It is said, also, by some writers, to advance far towards the north at certain seasons of the year, and sometimes even to

ascend the Himalayas nearly to the region of perpetual snow. According to Father Vincent Maria, a Carmelite monk, this monkey would appear to occupy quite an aristocratic position amongst the other quadrumanous inhabitants of the Malabar coast. The old missionary tells us that "the other monkeys pay such profound respect to this species, that they humiliate themselves before him, as if capable of appreciating his superiority and pre-eminence," and the magnificence of his wig seems even to produce an impression on the human inhabitants of Malabar, for the worthy father adds, that "the princes and great lords hold him in much estimation, because he is endowed above every other with gravity, capacity, and the appearance of wisdom. He is easily trained to the performance of a variety of ceremonies, grimaces, and affected courtesies, all which he accomplishes in so serious a manner, and to such perfection, that it is a most wonderful thing to see them acted with so much exactness by an irrational animal." Mr. Ogilby is probably in the right when he attributes the submission of the other monkeys to the wanderoo, rather to his physical than to his moral superiority, and the behaviour of several specimens which have from time to time been exhibited in this country has proved that the wanderoo is not superior to his congeners in sagacity. Robert Knox, another old traveller, tells us, that in Ceylon this monkey does little mischief, but lives in the woods, feeding on the leaves and buds of trees.

THE BRUH (*Macacus Nemestrinus*), described by Buffon under the name of the *Maimon*, is of a more robust form than the wanderoo, and has the tail much shorter, slender, nearly naked, and slightly curled, which has given origin to the name of the *Pig-tailed Monkey*, originally applied to this species by Edwards. The bruh is of a blackish-brown colour on the back, becoming lighter beneath and on the limbs; its face is flesh-coloured. It is an inhabitant of Sumatra and Borneo, and is described as being more docile and intelligent than its nearest allies; but this amiability of character would seem to disappear with age, although even old specimens are said to exhibit less ferocity and sullenness than the other large macaques. According to Sir Stamford Raffles, the natives of Sumatra are fond of domesticating the bruh, whose docility they turn to good account. They train it to climb the cocoa-nut trees for the purpose of picking the fruit, and it is said to show great discrimination in selecting the ripe nuts, of which, moreover, it picks no more than its master requires.

THE BHUNDER (*Macacus Rhesus*) is a species very nearly related to the bruh, with which it was indeed confounded by Cuvier. It is, however, furnished with a rather longer tail; and this appendage, instead of being slender and naked, is thick and well covered with hair; the upper surface of the body is of a greenish-grey colour, the individual hairs being annulated with light dun and dark brown; the lower surface and the inside of the limbs are light grey, and the callosities are bright red. The skin is remarkably loose and flaccid, hanging in folds even in the young animals; and this peculiarity, which occurs, although to a somewhat less extent, also in the bruh, enables these mon-

keys to be fattened to such a degree as to exhibit an enormous corpulence.

The blunder is a native of continental India, where it occurs abundantly in Bengal, and is also found in Assam, Nepal, and Simla. The hoonuman is the only other monkey which lives in these provinces, and the blunder appears to share with this sacred species in the respect of the natives. Captain Williamson tells us that in many places revenues are allotted for feeding whole tribes of blunders under the charge of a fakeer, or other mendicant priest, who ekes out the regular revenues attached to his office by charitable contributions levied upon travellers principally by the monkeys, who show themselves most accomplished beggars. They never molest any one, unless some cause of offence is given; but then they bite severely, and a trifling circumstance may produce the necessary irritation. Mr. Johnson also confirms these statements, and mentions that at a place called Bindrabun, "more than a hundred gardens are well cultivated with all kinds of fruit, solely for the support of these animals, which are kept and maintained by religious endowments from rich natives." The same writer tells us on good authority, "that in the district of Cooch Behar, a very large tract of land is actually considered by the inhabitants to belong to a tribe of monkeys which inhabit the neighbouring hills, and when the natives cut their different kinds of grain, they always leave about a tenth part piled in heaps for the monkeys. As soon as their portion is marked out, they come down from the hills in a large body and carry off all that is allotted for them, stowing it under and between the rocks in such a manner as to prevent vermin from destroying it. On this grain they chiefly live; and the natives assert that if they were not to have their due proportion, in another year they would not allow a single grain to become ripe, but would destroy it while green. It does not appear whether this singular and primitive payment of tithes has been settled by mutual agreement between the natives and the monkeys; but in other places, where no such arrangement is described as existing, the monkeys come freely in search of their dues into the houses, and carry off whatever they prefer with perfect impunity. In fact, the destruction of one of these animals is looked upon as a heinous crime by the Hindoos; and the writer last quoted mentions that two young officers who had shot at a blunder, were pelted with sticks and other missiles by the fakeers and other inhabitants of Bindrabun, where the supposed outrage took place, until the elephant on which they rode was driven into the river, where both the young men, as well as the driver of the elephant, were drowned. Nevertheless, the respect thus manifested for the monkeys does not prevent the jugglers who swarm in India from teaching these animals numerous tricks; and, according to Captain Williamson, "it is very diverting to see these little mimics counterfeiting the gait and motions of various professions, and especially corroborating by their actions the deluge of flattery which the jugglers pour forth in praise of everything relating to the English character. Their antics are so excellently just on these occasions, that many human professors of the mimic art might, without the smallest

disparagement, take a lesson from these diminutive imitators."

The blunder is one of the few species of Simiadæ which have produced young in our menageries, and, under these circumstances, the female exhibits a wonderful degree of affection for her offspring. In a case recorded at great length by M. F. Cuvier, the young animal continued for the first fortnight of its existence firmly clinging to the hair of its mother, with its mouth constantly applied to her nipple, only changing its position occasionally in order to cross over to the other side, but constantly turning its eyes to watch everything that occurred in its vicinity. At the end of a fortnight the little creature detached itself from its mother, and then, from the very first, exhibited an address and precision in its movements which could hardly have been anticipated. Still the mother watched it with anxious care, always ready to assist it in any difficulty into which it might fall during its gambols, and clasping it in her arms whenever she thought it was threatened with any danger. At the end of six weeks, however, when the young one was ready for more solid nutriment, this otherwise affectionate mother displayed a singular amount of selfish greediness, driving her offspring away from the front of the cage whenever their food was put in, so that it was only by stealth that the poor little beast contrived to secure a share of what was going.

Several other species of macaques inhabit the continent of Asia and its islands; but amongst these we shall only mention the URSINE MACAQUE (*M. Ursinus*), and the RED-FACED MACAQUE (*M. Speciosus*), in which the tail is reduced to a mere tubercle, and the BLACK MACAQUE (*Macacus Niger*), in which there is no trace of that appendage. The second of these species is remarkable as being the only monkey inhabiting Japan; and the third presents some peculiar characters, which have caused it to be raised to the rank of a distinct genus, under the name of *Cynopithecus*.

THE MAGOT (*Inuus Sylvanus*), or BARBARY APE, as it is frequently called, is the last species of the group of macaques to which we shall refer; it is remarkable as being the only monkey found in Europe. It differs from the rest of the macaques in having the posterior tubercle of the hindmost molar in the lower jaw divided into three parts by two little furrows, and from nearly all of them by the total absence of a tail.

The magot, when full grown, stands between three and four feet in height, and is of a robust form. The general colour of its fur is a yellowish olive-green, pale or greyish beneath; the face is of a dingy flesh-colour, much wrinkled, and marked with irregular brown spots; and the hairs surrounding the face are of a dirty grey. It usually goes on all fours, and appears to prefer rocky and mountainous districts for its habitation, where this quadruped mode of progression is the most practicable one. In its character it closely resembles the other macaques, being lively, intelligent, and docile when young, but becoming morose and intractable with increasing years. The vivacity and playfulness of the young and half-grown animals, have always rendered them great favourites with the itinerant showmen of Europe, and the magot has been well known in this

way from time immemorial. He has, however, another and still more important claim upon our attention: during the long series of years when the dissection of the human body was strictly prohibited, the anatomists of Europe derived all their notions of anatomy from the structure of this animal. Galen's description of the anatomy of man was almost entirely drawn from his dissections of the magot; and many years afterwards, when Vesalius published his great and valuable work, "*De corporis humani fabrica*," the surgeons of the old school refused to accept the new views therein brought forward, and adhered resolutely to Galen in all points when there was a difference between the statements of the rival anatomists. Some of the most distinguished physicians of the sixteenth century actually wrote treatises in support of the old notions; and it was not until Camper, two centuries later, proved that Galen's descriptions applied only to the magot, that we may consider the question to have been finally settled.

The chief home of the magot is in the mountainous parts of Northern Africa, in Algeria, and Morocco, where these animals reside in the forests in large troops, and are said to attack and drive away the beasts of prey which intrude upon their domains, although no doubt they often fall a prey to the leopard, and some of the smaller cats which abound in Northern Africa, and which, by the facility with which they climb trees, may easily steal upon them unawares during the night. Their food in a state of nature, according to M. Desfontaines, consists of "pine-cones, chestnuts, figs, melons, pistachio nuts, and vegetables, which they carry off from the gardens of the Arabs, notwithstanding all the pains they take to exclude these mischievous animals. While they are committing their thefts, two or three mount to the summits of the trees and of the highest rocks to keep watch, and as soon as these sentinels see any one or hear a noise, they utter a cry of warning, and immediately the whole troop takes to flight, carrying off whatever they have been able to lay their hands on." M. Desfontaines adds, that "in the wild state, they generally bring forth only a single young one, which, almost as soon as it is born, mounts on the back of its mother, embraces her neck with its arms, and is thus transported in safety from place to place; sometimes, however, it remains firmly attached to the breast."

The origin of the colony of this species, which still lives upon the rock of Gibraltar under the special protection of the English garrison, has frequently been a subject of discussion; some naturalists thinking that the species must have been imported into the south of Spain, as some of its Eastern allies have been into the Mauritius. It would appear, however, that the extreme southern part of the Spanish peninsula harbours a considerable number of terrestrial animals, which are otherwise peculiar to the opposite shores of Africa; and, according to some authors, the magot itself occurs in a wild state upon other mountains of Andalusia, and even of Granada. Ancient writers also are silent with regard to the occurrence of their *Pithecus*, which was undoubtedly the present species, in any other part of Europe; although Procopius, a Greek writer of the

sixth century of the Christian era, mentions man-like apes inhabiting Corsica. In the absence of all positive evidence, one way or the other, we can only suppose that the magot, with the other African forms of animals which occur with him in Southern Europe, may have extended his range into the latter region at a period when the two continents were united. Even then it would be curious that the European representatives of the species should confine themselves to a bare rock at the most southern point of the peninsula, as if anxious still to be within sight of the shores which undoubtedly constitute their true home, but from which they are for ever excluded. This, however, may perhaps be explicable upon the supposition, that important changes of climate may have taken place in Spain since the disruption of the continents at the Pillars of Hercules.

The group of the *Baboons* at which we now arrive, and which closes the series of Old World monkeys, resembles the macaques in most of its characters, differing principally in the form of the face, which, in the baboons, is produced into a snout and more or less truncated, or, as it were, cut off at the extremity. They have small eyes, placed closer together than in any of the preceding groups of monkeys; the hindmost molars in the lower jaw are furnished with one or two accessory tubercles as in the macaques; and the tail, which is usually short, is placed very high up on the rump.

The baboons are all of considerable size, larger than the other monkeys, but usually smaller than the true apes. They are of a robust form, with stout powerful limbs, upon which they usually go upon all fours; they are, in fact, the most animal of the Simiadae. Their jaws are enormously powerful, and armed with immense canine teeth, with which they are able to inflict very severe wounds upon their adversaries. They usually take up their abode amongst the rocks, and are confined to the African continent, in all parts of which some species are found. One species also occurs in Arabia. They are ferocious and disgusting in their habits, and during the breeding season the posterior callosities, which are of large size and generally of a bright red colour, become so turgid and conspicuous, as to give the creatures a most repulsive aspect. In confinement, even the females seem to delight in exposing these disgusting features to the gaze of the spectators, whilst the males usually exhibit the lasciviousness of their nature in such an odious light, that they can rarely be exposed freely to the public. In many cases they have been known to notice women amongst the spectators before their cages, sometimes even selecting the youngest and handsomest for this questionable compliment, and evincing their preference by unmistakable gestures; so that there can be little doubt, that had they the opportunity, they would resort to violence for the gratification of their passions.

THE MANDRILL (*Papio Mormon*), Plate 2, fig. 4. The mandrill, the largest and most powerful of the baboons, belongs to a genus in which the tail is very short, forming a small naked process which stands up

perpendicularly to the spinal column. The head of this baboon is of large size, a circumstance which is due principally to the enormous development of the facial bones; in the males, especially, these bones form a long muzzle, on the sides of which are a pair of large bony protuberances; the upper canines are of immense size; the lower jaw is enormously powerful and armed with sharp canine teeth; the surface of the skull exhibits strong ridges for the attachment of the muscles; and no one who looks at the entire skull of a mandrill, can doubt for a moment that the creature possessing such formidable weapons and such powerful means of setting them in motion, would be as terrible an antagonist as almost any beast of prey.

The adult male sometimes attains a height of upwards of five feet when standing upright. The general colour of the fur on the back and sides is a light olive-brown, and on the lower parts of the body a silvery grey. On the forehead and crown of the head the hair is directed upwards, giving a curious appearance to the head; the face is naked, and the protuberant sides of the nose are strongly ridged and marked with bright red, light blue, and purple. The callosities are large, and of a bright red colour. In the females and young males, the muzzle is shorter and less protuberant than in the old males, and of a uniform blue colour.

The native country of this formidable animal is the western coast of Africa, especially in the district of Guinea, where it appears to have been often confounded with the chimpanzee in the stories related by the Negroes to travellers. It is known to the natives of different districts by a variety of names, amongst which *Smitten*, *Choras*, *Boggo*, and *Barris* are recorded by authors; the latter name is the one given to the gorilla by De Laval (see p. 17), and we have already stated that the name of *Drill*, now commonly applied to the following species, and which evidently forms part of the name under which the present animal is known, really belongs to the chimpanzee. Considering the vicious character of the mandrill, we may, perhaps, suppose that many of the narratives of travellers, with regard to women being carried off into the woods by monkeys, apply rather to this species than to the chimpanzee, although both of them are charged with this crime. The mandrills are also described as associating in large troops, and driving away other wild animals, including even the elephants, from the districts of the forest in which they choose to take up their quarters, whilst their human neighbours are afraid to pass through the woods in which they reside, except in large companies and well armed. In a state of nature the mandrills live principally upon fruits, although, like the other baboons, they doubtless often devour small animals, and they are said sometimes to make a descent upon the negro villages, and plunder them of everything eatable. In captivity they eat almost anything, and usually acquire a strong taste for intoxicating liquors. A fine specimen which was exhibited many years ago at Exeter Change, and which had retained his youthful tractability to a later period than is usual with the male baboons, was in the habit of drinking his pot of porter daily, accompanying this indulgence with a pipe, which he smoked with great gravity.

When thus engaged he would sit in his chair with his pot of porter in one hand, and no doubt he would have been as indignant as little Tony Weller, had he been offered a pint instead of his customary allowance. This mandrill bore the appropriate name of *Happy Jerry*, and his reputation was so wide-spread that he was actually honoured with an invitation to Windsor Castle from his Majesty George IV.

THE DRILL (*Papio leucophaeus*) is another species of short-tailed baboon very nearly allied to the mandrill, and, like it, an inhabitant of the Guinea coast. It is rather smaller than the preceding species; its fur is of a more greenish colour; the sides of the muzzle are less protuberant, and the skin of the face is entirely black. It was originally described as a distinct species by Pennant, under the name of the *Wood Baboon*; but little or nothing is yet known of its habits in a state of nature, although in these it probably resembles the mandrill.

THE CHACMA (*Cynocephalus porcarius*) belongs to another genus of baboons, in which the tail is of moderate length. The chacma is the largest species of this genus, equalling a large mastiff in size and form, exceeding it in robustness and strength. It is of an olive-black on the back, with the sides and belly paler; the whiskers are greyish and the face brown. It is an inhabitant of the Cape of Good Hope, where it lives in the mountains amongst the rocks in troops of three or four hundred together. Travellers through the passes of the Cape Mountains describe the noise made by the baboons, when they see the loaded waggons intruding upon their territory, as something terrific; and should the travellers outspan for the night in the vicinity of their habitations, the yells and howlings of the baboons are kept up all night, so as effectually to scare sleep from the intruders' eyelids, and make them long for the first dawn of day to recommence their toilsome march. Sometimes, however, it would appear that the baboons take matters more quietly, sitting peaceably on the summits of the rocks and gazing down upon the train of waggons; should they be within reach of the rifles of the travellers they scramble away immediately, climbing up the faces of nearly perpendicular rocks, by the help of certain ereeping plants which, in many places, form a network over the rocks, and from the use to which the baboons put them, are called by the boors *Monkeys' ladders*. Their movements under such circumstances are said to be indescribably amusing, but they cannot always be observed in safety; for the baboons sometimes attack travellers by throwing stones down upon them.

The food of the chacma, like that of the other baboons, consists partly of fruits and roots, and partly of animal substances, such as insects, lizards, and the eggs of birds. In search of vegetable aliments, the troops often descend into the cultivated districts, where they do great damage. From this circumstance, coupled with their ferocity and other evil qualities, the chacmas are regarded with much antipathy by the Cape boors, and this feeling appears even to be shared by the dogs; for we are told that there is no other animal which they attack so readily, or with so much determination. Such are the strength and ferocity of

the chacma, however, that some of the dogs generally pay dearly for their temerity, and the boors would almost prefer setting their dogs upon a lion, to letting them go in pursuit of one of these animals. Even the leopard, which inhabits the same districts as this powerful baboon, and feeds principally upon the females and young males of the chacma, often meets with a disappointment when he ventures upon an old male.

Notwithstanding these bad qualities the young chacmas are often domesticated at the Cape, when they are said to show great docility, and to fulfil the important office of keeping guard and giving notice of the approach of a stranger as well as or better than a dog. They are also trained to perform some other useful duties. Sometimes a smith will be seen with a chacma attending to his fire, or a peasant committing the guidance of his oxen to one of these animals; but in whatever way they may be employed, they require to be always under the eye of the master. They are also noted for the sagacity with which they reject any unwholesome food, so that a Hottentot will never touch anything that has been refused by a chacma. This renders it exceedingly difficult to poison them, and M. Pucheran mentions a case in which one of these animals actually abstained for ten days from touching some poisoned food which had been prepared to kill him. From the account given by M. Le Vaillant of one of these baboons which was in his possession in Africa, they would appear to be good-tempered, amusing, and even affectionate; but these good qualities in all probability wear off in course of time, as the adult specimens which have been kept in menageries in Europe, have exhibited all the ferocity and other disgusting qualities of their congeners.

THE DERRIAS (*Cynocephalus Hamadryas*). Several species of baboons are found abundantly in the north-eastern part of the African continent, in Nubia, Abyssinia, and even in the mountains of Arabia. Amongst these the most celebrated is the derrias, a large species, standing about four feet in height when erect, which is remarkable from its having the whole fore part of the body, as far as the loins, covered with long shaggy hair, whilst that of the hinder quarters is short; so that the creature has not unaptly been compared to a clipped French poodle. In its habits the derrias closely resembles the preceding species.

By some writers this is considered to be the ape *Thoth*, so commonly represented upon Egyptian monuments, usually in a sitting posture, but variously employed. He was the emblem of Hermes (Thoth) the inventor of letters and of the art of writing, and Horapollon, an ancient author, relates that whenever one of these baboons was brought to the temples, he was met by a priest who presented him with tablets and pen and ink, to ascertain whether he really belonged to the family of those who understood writing.* Subsequently the thoth appears to have become the symbol of the supreme judge of the souls of men; and in this capacity he is frequently represented with a pair of scales, in which the good and bad actions of those before him

* This may remind our readers of the story in the "Thousand and One Nights," in which a prince, metamorphosed into an ape, discovers his human quality by writing.

are to be weighed. Ehrenberg thinks, with some probability, that the singular head-dress which is so frequently represented on Egyptian monuments, was an imitation of the remarkable hairy covering of this sacred monkey.

THE COMMON BABOON (*Cynocephalus Papio*), the last species to which we shall refer, is a native of the western coast of Africa, where it appears to be exceedingly abundant. Of all the baboons it is the one which is most frequently brought to this country, and its good temper, familiarity, and curious habits when young, render it a great favourite with the visitors to menageries. As it increases in age, however, it acquires the same repulsive habits as its allies, although perhaps in a somewhat less degree, and in some cases the adult males have been known to retain much of their youthful docility. It also exhibits great intelligence.

The general colour of this baboon is reddish-brown; the whiskers are light fawn colour; the face nearly black, and the callosities reddish-violet. It is one of those Simiadae which support the climate of Europe with least inconvenience, and it has frequently bred in our menageries. The adults, and even the males, exhibit much attachment to the young animals, nursing them with great tenderness whilst they are very young, and treating them afterwards with far more kindness than is usually shown by monkeys in captivity towards their offspring.

With the baboons we terminate the long series of interesting species which constitute the family Simiadae, and at the same time the first section of the great tribe of SIMIÆ or monkeys. In these, as already stated (p. 14), the nostrils are placed close together and separated only by a narrow partition; whilst in the second section of the Simiæ the nose is broad and flat and the nostrils separated by a wide interval. We have already adverted to the remarkable zoological distribution of these two nearly-related groups of animals; the first section, *Catarrhine*, being restricted to the eastern hemisphere, while the *Platyrrhine*, or *Flat-nosed* monkeys are as exclusively confined to the New World. In the Old World, as we have seen, the monkeys are almost exclusively inhabitants of tropical regions, and this is still more decidedly the case in America, where these animals are confined to the forests of the hottest parts of the southern continent.

Although the species of American monkeys are exceedingly numerous, they present no such variety of form and habits as their eastern brethren, and we shall therefore be able, by selecting a few of the more striking species, to give the reader a good idea of the whole group. They are all of small or medium size, and arboreal in their habits; all are destitute of cheek-pouches and callosities, which are possessed by the majority of the Old World species; their food is of a mixed animal and vegetable nature; and in their dispositions they are usually good-tempered, docile, and intelligent. Nevertheless, with all these characters in common, the American monkeys present certain structural peculiarities, by which they may be divided into two distinct families.

FAMILY II.—CEBIDÆ.

The first and most important of these families is that of the Cebidæ, which is at once distinguished from all the other monkeys by a most important character, namely, the presence of four additional molars—there being six of these teeth in each side of each jaw; so that, the number and distribution of the other teeth remaining the same, there are in all thirty-six teeth in this family, whilst the rest of the monkeys have only thirty-two. From the second family of American monkeys the Cebidæ further differ in having the fingers all furnished with flat nails. With but one or two exceptions they have very long tails, and in most cases these organs are prehensile at the tip, so that these creatures are, as it were, provided with a fifth hand, which is of the greatest service to them in their rapid and agile movements amongst the branches of the trees.

THE RED HOWLING MONKEY (*Myctes Seneculus*), Plate 2, fig. 5. The Howlers, or howling monkeys (*Myctes*), are the largest and most robust of the American monkeys, appearing in some respects to represent in the New Continent the oranges and chimpanzees of the Old World. Their jaws are large and powerful, and armed with strong teeth, the structure of which indicates their food to be principally of a vegetable nature. Their colours are usually reddish or brown, and they are furnished with a long and well-furred tail, which has the tip naked on the lower surface, and is strongly prehensile.

The most remarkable peculiarity of these animals, and the one to which their name of howlers refers, consists in the fearful noise which they produce every morning and evening, and often during the night, which, according to Humboldt and Azara, may be heard at a distance of more than a mile. Azara compares the noise "to the creaking of a great number of ungreased carts;" and Waterton states that, on hearing the howlers in the primeval forests of Guiana, "you would suppose that half the wild beasts of the forest were collecting for the work of carnage; now it is the tremendous roar of the jaguar, as he springs on his prey; now it changes to his deep-toned growlings, as he is pressed on all sides by superior force; and now you hear his last dying moan beneath a mortal wound." It is still a question whether these terrible howlings are produced by a single monkey at a time, or by a general chorus of a whole tribe; but the Indians fully believe that one of the number commences the concert. Maregrave, in his "Natural History of Brazil," published in 1648, gives us, evidently from the reports of the Indians, a very circumstantial account of the proceedings of the howlers. He says that every morning and evening these monkeys assemble in the woods, and that one of them then perches himself in the highest place he can reach, and makes a sign to the others to sit around him. He then commences his discourse, with a voice so loud, that, according to our author, it might be supposed that the whole of them were howling together, although they sit in the most decorous manner in perfect silence, listening to the vociferation of the self-elected preacher. When the latter ceases, however, he makes another sign with his

hand, when the assembly indemnifies itself for the previous restraint by bursting at once into clamour. Maregrave adds, that they again become silent at a sign from the chief, who then resumes his howling for a time. When he ceases the assembly breaks up. This tale evidently contains great exaggerations; but it is quite possible that one of the monkeys may commence the howling, and the reports of more trustworthy travellers prove that a single individual is quite capable of producing a most unbearable noise.

The structure by which these creatures are enabled to give utterance to sounds apparently so out of all proportion to their size, is of a very curious nature. The two sides or branches of the lower jaw are enormously enlarged, so that they form a pair of bony plates descending vertically from the skull, and, when seen from the side, appear fully as large as the latter. Between these is a rounded bony case, consisting of the central part of the hyoid or tongue-bone, inflated into a thin hollow ball. This receives a membranous pouch, which communicates with the larynx, and it is by the reverberation of the voice in the hollow space thus formed, that it acquires the tremendous power to which we have just referred.

In their habits the howlers are dull and morose; their movements are slow; and they live in small parties under the guidance of a chief, who is always an old male. The latter is said to place himself in an elevated situation, to guard against the approach of danger to the little band under his care; but, notwithstanding this precaution, the animals may be easily approached, although it would appear to be by no means safe to stand under the trees occupied by them, as a sudden fright sometimes produces very disagreeable effects. In passing from branch to branch, the howlers, in common with many other American monkeys, make use of their tail as a fifth hand; and so great is its prehensile power, that, even after the animal is killed, it not unfrequently remains suspended by the tail. In some places they are eaten by the Indians, after being roasted on a spit; but the resemblance of the body of one of these monkeys, when skinned, to that of a child, always causes Europeans to regard such food with a feeling of repugnance. The female produces only one at a birth, which she carries on her back.

The Red Howler (*Myiotes Seniculus*), called the *Alouate* by Buffon, and the *Royal Monkey*, or *King of the Monkeys*, by the South American Indians, is a native of Guiana, where it inhabits only the woods in the lower grounds. Its length, to the root of the tail, is usually twenty-two inches, and the tail is of about the same length. The general colour of the hair is a fine red, brighter on the head and limbs; the face is naked and black. Several other species are found in different parts of the South American continent. Amongst these, the most abundant and most widely distributed appears to be the *Brown Howler* (*M. Ursinus*), which occurs in several provinces of Brazil. It is the monkey whose habits furnished Maregrave with the foundation for the story given above, and this has obtained for it the name of the Preacher monkey.

THE HORNED MONKEY (*Cebus fatuellus*), Plate 2,

fig. 7. The *Sapajous*, *Sajous*, or *Capuchins* (*Cebus*), also called *Weepers*, from their plaintive cry, include a considerable number of American monkeys. In their general form they resemble the howlers, but are always of smaller stature and less robust form. Their heads are short and rounded, and their tails, although prehensile, are destitute of the naked space at the extremity, which gives that organ, in the howlers and spider-monkeys, such a firm grasp of any object round which it may be coiled. Their hands are furnished with perfect thumbs, both on the fore and hind limbs.

In nearly all the species the face is bordered by a profusion of long hair, which gives the little creatures a most formidably-whiskered appearance, and the top of the head is often similarly provided. In the horned monkey the hair of this part forms two strong black tufts, which give the creature the appearance of being furnished with horns. Its general colour is chestnut red, with the chest and belly bright red, and the limbs and tail brown. It is an inhabitant of Brazil and Guiana.

These monkeys live in troops in the boundless forests of the South American continent, where they feed upon fruits, seeds, insects, and corn, and also upon small birds and their eggs. In their turn they furnish a considerable portion of the food of the small carnivorous quadrupeds, such as the ocelots, which abound in the American forests, and which are very arboreal in their habits. The sajous are of a gentle disposition, and easily tamed, when they may be taught a number of amusing tricks. They are frequently brought to Europe, not only for exhibition in menageries, but also to be carried about by itinerant musicians, who teach them to go through a variety of evolutions, such as firing off a small gun, and sweeping up the platform on which they are exhibited with a miniature broom. Their intelligence is very considerable: they will break a nut which is too strong for their teeth by beating it between two stones; and a specimen which was living some years ago in the menagerie at Paris, would light a lucifer match by rubbing it upon the wall of his cage, and then hold it in his fingers and watch it burning without the least fear. Rengger, in his "Natural History of the Mammalia of Paraguay," mentions several circumstances illustrative of the high degree of intelligence possessed by these monkeys. They peel oranges, and tear the wings and legs off the larger insects before eating them. When a living bird is given to them, they first bite a hole in the skull, through which they extract the brain, then pluck off the feathers, tear the bird limb from limb, and finally gnaw the flesh off the separate bones. On giving an egg to a young one for the first time, he would break it very clumsily, and make a shocking mess with it; but in a short time he learnt by experience to break the end gently against a solid body, pick off the pieces, and then suck out the contents without losing a drop. This mode of sucking eggs is also adopted by the spider-monkeys, and some others. But perhaps the most remarkable instance of intelligence presented by the sajous is the following:—Rengger had been in the habit of giving his specimens small quantities of sugar twisted up in paper. One day he inclosed living wasps in the papers, and the unfortu-

nate monkeys, opening their prizes incautiously, were severely stung. But this was never afterwards the case; for, becoming wise by experience, they always held the papers up to their ears before opening them.

The species most frequently brought to Europe is the BROWN SAJOU, or WEEPER MONKEY (*Cebus Apella*), which is exceedingly abundant in Guiana, and also occurs in Brazil and other parts of South America. It measures about fourteen inches to the root of the tail, which is between two and three inches longer than the body. It is of a reddish-brown colour, darker on the back, head, limbs, and tail, but with the upper part of the arms tawny or greyish-yellow.

THE COAITA (*Ateles Paniscus*), Plate 2, fig. 6. The Coaita is one of the most widely distributed of the well-known American monkeys to which the name of *Spider monkeys* has been given, in allusion to the great length and slenderness of their limbs. It is found over the greater part of the South American continent, from Brazil and Guiana in the West, to Peru in the East. In common with the other species of its genus (*Ateles*), it is totally destitute of thumbs on the anterior members, which thus consist only of four fingers, the only trace of the thumb being an imperfect metacarpal bone, completely concealed within the skin. The tail, like the limbs, is very long, and exhibits a piece of naked callous skin on the lower surface at the tip; this, coupled with the great muscular power of the tail, renders it, like that of the howlers, a most powerful prehensile organ, and the animals use it freely as a fifth hand in almost all the transactions of life. The agility of movement displayed by these curious creatures when springing freely about in their arboreal home, is in a great degree due to this fifth hand; grasping a branch with it, they swing to and fro in the air, until gaining a sufficient impetus, they launch themselves towards some other object; and thus with the aid of the long limbs, pass over great spaces with inconceivable rapidity. Even when confined in menageries they exhibit astonishing agility. We are told also by Dampier and Dacosta, that when these monkeys want to pass a river, or to get from one tree to another at a little distance, without descending to the ground, they form themselves into a sort of chain, each clinging to the other by his tail; the whole then swing to and fro, until the lowest individual at the free end of the chain contrives to get hold of the object to be attained, when he draws up the rest, and the whole pass over.

The coaita measures about two feet in length to the root of the tail, and is covered with long black hair, except upon the face which is naked and brown. They live in the forests in troops, but frequently descend in search of nourishment to the plantations, especially the Indian-corn fields, which they plunder to an extent that is anything but agreeable to the owners. Their booty is carried off to be eaten at leisure in the woods, and here again the tail comes into play; for an old negro told Mr. Gardner, that he had often seen the coaita making off with three ears of Indian corn, one in its mouth, one under its arm, and the third in its tail. The coaita, and the other spider monkeys, also feed to a certain extent upon animal substances, such as insects, molluses, birds' eggs, and even small fishes;

and those which reside in the vicinity of the sea are said sometimes to descend to the coast, and regale themselves with marine luxuries, especially oysters, which they are ingenious enough to break between two stones. They are said also to adopt the same course with nuts which are too hard for their teeth to crack, and their general intelligence is very high, certainly higher than that of any other American monkeys, and inferior to that of few of the Old World.

In captivity the coaita is very gentle, and soon becomes tame. It is impatient of cold, and rather melancholy in its aspect, but exceedingly amusing from its agile gambols. An interesting account of a tame coaita will be found in Mr. Gardner's "Travels in the interior of Brazil." It became a favourite of his whole party, and especially cultivated the friendship of a large mastiff which accompanied them on their journey. On the march, Jerry, as the monkey was called, always rode on the back of his canine friend, but he was not at all particular as to whether his face was towards the head or tail of the dog, except in going down hill, when he always turned his face forwards; and to prevent himself from being ignominiously slipped over the head of his charger, made use of his tail as a crupper, by twisting its prehensile extremity round the root of the dog's tail.

THE SQUIRREL MONKEY (*Callithrix sciureus*), Plate 3, fig. 8. The Squirrel monkey, *Saimiri* or *Tee Tee*, is undoubtedly the prettiest, the most amiable, and probably the most intelligent of the whole tribe. The length of its head and body is only about ten inches; its tail, which is scarcely prehensile, measures thirteen and a half; its general colour is olive-grey, with the arms and legs reddish or orange-coloured; and the face is bare and whitish, with the nose black. Its eyes are large, soft, and lustrous, giving the little creature an expression of intelligence, heightened by the form of its head, in which the skull is of very large size as compared with the facial bones. The skull, with its inclosed brain, is in fact larger in proportion to the size of the animal than that of any other monkey, so that, if we may take the mere size of the brain as a measure of intelligence, we may easily account for the superiority of this interesting little creature.

The squirrel monkey lives in the forests of Guiana and Brazil, feeding principally upon fruits and insects. Its tail is of little use to it in its arboreal gambols, but it appears to employ it in keeping itself warm, by winding it round its body. In captivity it is gentle and affectionate, and one of the most interesting of the monkey tribe. Humboldt has given some interesting details with regard to individuals in his possession. When he spoke to them for some time, they listened with the most marked attention, but soon raised their hands to his lips, as if to catch the words as they escaped. They recognized the objects represented in engravings, even when not coloured; and when the figures of insects and fruits were shown to them, they stretched out their hands towards the paper, and endeavoured to seize their simulated food.

THE DOUROCOULI (*Nyctipithecus trivirgatus*). The large eyes of the delicate little squirrel monkeys to which we have just referred, indicate probably that

their period of activity is to a certain extent nocturnal; but in the *douroucoulis*, this character is carried to a far greater extent, and this animal and its allies are known to sleep through the day, and to roam about at night in search of their food. Their eyes, like those of the cats, are luminous in the dark; their voice is very strong, and, according to Humboldt, resembles that of the jaguar. It seems probable, indeed, from a statement made by that author in his "Aspects of Nature," that the concert of fearful noises heard during the night in the forests of tropical America, and usually attributed to the howling monkeys alone, is due to the combined efforts of many different vocalists.

The *douroucoulis* shelters itself in the holes of large trees, and according to Humboldt, lives in pairs, and not in troops, like most other monkeys. Spix, however, says that he has seen them going about in bands. The tail is long, but not prehensile, and the animal winds it round its body when in repose. The ears are almost entirely concealed by the long hairs on the sides of the head; the colour of the fur on the upper parts of the body is grey; the lower parts are orange, and this colour also appears on the sides of the neck. The forehead exhibits three black lines, diverging backwards; and the tail is yellowish-grey, with the tip black. The length of the head and body is about ten inches, and that of the tail eleven. The *douroucoulis* feeds principally on insects, and also on small birds, which it easily surprises when they are asleep.

FAMILY III.—HAPALIDÆ.

The Marmozets (*Hapalidæ*), forming the third family of the *Quadrumanæ*, and the second of the American monkeys, are distinguished from the *Cebidæ*, to which they are in other respects very closely allied by the absence of the additional molar tooth, which, in the latter, occurs on each side in each jaw. Thus the total number of their teeth and that of the different kinds of teeth becomes the same as in man and the higher *Quadrumanæ* of the Old World. The tubercles of the molars are also more acute than in the *Cebidæ*, indicating that the marmozets are more addicted to an animal diet, and, in fact, a great part of the nourishment of these creatures consists of insects, eggs of birds, and even small birds themselves, when these come within reach of the carnivorous little monkeys. Their tails are long and well-furred, but never prehensile.

The marmozets are all of small size, rarely exceeding that of a squirrel; their heads are small and rounded; their ears usually provided with tufts of hair; the thumbs of the anterior hands are scarcely opposable, but those of the hinder pair are completely so, and these are furnished with flat nails whilst all the rest of the fingers bear claws. In every particular of their organization these monkeys show themselves to be inferior to the rest of the great group of *Simiæ*, and to approach more closely to the ordinary mammals, whilst the almost complete absence of convolutions on the surface of the brain would seem to indicate a degree of intelligence far below that, not only of the other *Quadrumanæ*, but even of the majority of the placental *Mammalia*. In this respect, indeed, the marmozets

appear to approach the squirrels, with which they also have some other analogies; they are incapable of the education which most of the other *Simiæ* and some of the *Cebidæ* in particular, may be brought to receive, and their instinctive faculties are very highly developed. The extent of their intelligence will be seen from the particulars recorded by Audouin of the behaviour of two marmozets observed by him. In a picture they could recognize their own likeness, and those of flies, locusts, and beetles, the latter of which they endeavoured to seize with great avidity. The picture of a cat, on the other hand, and that of a wasp, caused them to shrink with terror, and when occupied in catching the flies which entered their cage, which they did with incredible dexterity, the appearance of a wasp attracted by a piece of sugar fixed in the bars, drove them at once to take refuge at the bottom of their cage. Astonished at this instinctive dread of an insect which they could never have seen before, Audouin took a wasp and brought it near the two marmozets, when they immediately hid their heads between their fore hands and closed their eyes. But as soon as he substituted for the wasp, a grasshopper, a beetle, or some other harmless insect, they darted upon it greedily and devoured it with the greatest gusto. Sugar and sweet fruits also constituted favourite articles of food with them, and they possessed the art of sucking eggs in great perfection. They would not eat flesh; but when a small living bird was given to them, they would seize upon and kill it, then open its skull and devour the brain, at the same time licking up any blood that might flow; they would also sometimes eat the bill, the tendons of the feet, and some other parts, but always avoided the flesh. Mr. A. R. Wallace during his voyage up the Amazon had an opportunity of observing many similar habits in specimens of several species of this family, which he kept in confinement.

M. Audouin states that his marmozets recognized those who had the care of them, but this is opposed to the observations of most other naturalists, and must have been due to peculiar conditions in the individuals observed by the great French entomologist.

In their native regions, the luxuriant forests of South America, these elegant little monkeys live amongst the trees in small troops, displaying, amongst the branches, an agility almost as great as that of the beautiful little inhabitant of our own woods—the squirrel. Their activity, however, is nocturnal. They produce as many as three young ones at a birth, which is an additional indication of their approach to the lower *Mammalia*; for the rest of the *Quadrumanæ*, and even the *Cheiroptera*, usually produce only a single young one; and, as if to show this more clearly, it sometimes happens that when they breed in captivity, the mother will destroy one or more of her offspring, a circumstance which occurs still more frequently with the true *Carnivora*, and some of the *Rodentia*. Their young are born with their eyes open.

From the foregoing account of the intellectual qualifications of the marmozets it is evident, that the high esteem in which they were formerly held as pets must have been due almost exclusively to the elegance of their form, and the agility of their movements; but

whatever may have been their peculiar claims to such an honour, there is no doubt that in the sixteenth, seventeenth, and eighteenth centuries they were the favourite companions of the most fashionable ladies of Europe, and probably had even more tenderness lavished upon them than is bestowed upon the lap-dogs of the present day. We find the word marmozet applied to young children as a term of endearment by several writers of the last century. A remarkable indication of the early prevalence of the taste for having marmozets as pets, rendered the more striking by the absurd anachronism involved in it, is furnished by the fact that Guido has introduced one of these animals into his picture of the Abduction of Helen.

Of this group, which includes only a single genus, the species appear to be rather numerous, about thirty having been already described, whilst, from the accounts given by recent travellers, there can be little doubt that many more remain to be discovered. As, however, they are all very similar, both in structure and habits, we shall only refer to a few of the best known species.

THE COMMON MARMOZET (*Jacchus vulgaris*), Plate 3, fig. 9, a native of Brazil, is of an ash colour, with the rump barred with brown, and the tail variegated with darker and lighter rings; the head and back of the neck are of a reddish-brown colour, and on the sides of the head, both before and behind the ears, are numerous long hairs of an ash colour. It measures about eight inches in length, whilst its tail is nearly eleven inches long.

THE BLACK-TUFTED MARMOZET (*J. penicillatus*), also a native of Brazil, closely resembles the preceding, but has the head and the tufts of long hair about the ears black; the latter character also occurs in the White-headed Marmozet (*J. leucocephalus*), in which, however, the whole front of the head is white, whilst the general colour of the fur is reddish.

THE MARIKINA (*J. Rosalia*), Plate 3, fig. 10, belongs to a section of the marmozets which has been regarded by M. Geoffroy Saint-Hilaire as forming a distinct genus (*Milas*), characterized by having the lower incisor teeth short and broad, whilst in the rest of the family they are long and narrow. It is a beautiful little creature of a golden yellow colour, with the head and shoulders covered with long hair, forming a sort of mane, which has obtained it the name of the *Lion monkey* from some authors. It occurs in several parts of South America, especially in Guiana, Brazil, and Peru, and, from the beauty of its silky fur, its gaiety, and gentleness, it was formerly one of the greatest favourites of all the marmozets. The species was first described by Brisson, from a living specimen in the possession of Madame de Pompadour.

THE PINCHE (*J. Edipus*), another pretty little species inhabiting the same countries as the marikina, has the long hairs confined to the forehead and the crown of the head, where they form a sort of crest or tuft of a white colour, the general colour of the fur being a tawny brown, with the lower parts white, the face black, the ears reddish, and the tail red at the base and black at the tip.

The marmozets close the great and interesting group

of the Simiæ, which, as we have seen, includes those species which approach most nearly to humanity in their structure, and exceed all other animals in natural intelligence, whilst the last members of the series cannot be regarded as greatly superior, in either respect, to creatures which the necessities of classification compel us to place at a great distance below them.

In the second group of the Quadrumana, that of the *Prosimiæ* or *Lemurs*, the general animal character of the species is equally if not more strongly marked than in the marmozets, and yet every species exhibits the quadrumanous character in perfection, the thumbs of all the four extremities being opposable. They are distinguished from the Simiæ, as already stated (p. 15), by the presence of a claw upon the first finger of the hinder hands, although the thumbs and the remainder of the fingers on both pairs of hands are almost invariably furnished with flat nails. The incisor teeth are variable in number, being frequently unequal in the two jaws; the canines are always present, and usually of considerable size, and the molars, of which there are either five or six on each side, are often acutely tubercular, indicating an insect diet.

The whole of the *Prosimiæ* are inhabitants of the Old World, and the majority of them are confined to the large island of Madagascar, where they are almost the only representatives of their order.

FAMILY IV.—LEMURIDÆ.

Of the species peculiar to the remarkable island of Madagascar, by far the greater number belong to the family of the Lemuridæ or true Lemurs. In these the general form of the body greatly resembles that of a cat set rather high upon its legs; the thumbs are all opposable, and the first finger of the forehands well developed; the muzzle is elongated and pointed something like that of a fox, from which circumstance the name of Fox-nosed monkeys has frequently been applied to the lemurs. The eyes are large and placed on the front of the head, the body is clothed with a thick soft fur, and the tail is long and full.

But the most positive distinctive character of the family consists in the number of the teeth, of which there are thirty-six, namely, four incisors, two canines, and six molars in each jaw. The upper incisors usually form two pairs, separated by a small space, and placed almost perpendicularly in the jaw; the lower ones are much longer, and project almost in a horizontal direction; the upper canines are much longer than the lower ones, and the salient tubercles of the molars indicate frugivorous habits.

These beautiful animals, of which numerous species, varying in size from that of a marten to that of a large cat or fox, occur in Madagascar, are nocturnal in their habits, coming forth in troops from their hiding-places at sundown to exhibit their wonderful activity amongst the branches of the trees, through which they sweep with a swiftness and silence that induced Linnæus to compare the species known to him to lemures or ghosts. Their food, as already remarked, consists to a great extent of fruits, but they also feed freely on insects,

and, like all the lower *Quadrumanæ*, have a great liking for eggs and young birds, which they may seize with great ease during their nocturnal expeditions through the forest. The females produce only a single young one at a birth, and attend to this with the greatest tenderness. At first they carry their offspring about in their arms, the little creature aiding its mother's efforts by clinging to her breast; but as the young lemur increases in size, it coils itself round her middle, and is thus carried about.

In confinement the lemurs are lively and playful, and the elegance of their forms and gracefulness of their actions render them most pleasing objects in our menageries, where, notwithstanding the tropical tenderness of their constitution, they have been known to live for many years, and even to breed. They exhibit less intelligence than the higher *Quadrumanæ*, but at the same time are destitute of the ferocity which often characterizes the latter as they increase in years. In general the lemurs are very gentle and harmless, fond of licking the hands of their visitors, and testify their contentment by a curious purring noise. According to the observations of M. F. Cuvier upon the mongous, the claw of the first finger of the hinder hands is frequently introduced into the ear and kept there some time, for what purpose does not appear; the use of the projecting incisors of the lower jaw seems to be to act as a sort of comb in cleaning the fur, which the animals are very fond of doing, not unfrequently performing this good office for each other.

THE RING-TAILED LEMUR (*Lemur Catta*), or **MACACO**, Plate 3, fig. 11, is one of the most elegant, and, at the same time, one of the best-known species of this family. It is about the size of a large cat, and its general colour is a delicate ashy grey; the sides of the head and face, the throat, chest, and belly, are white; and the long bushy tail is beautifully marked with broad rings of black and white. The form of the head in this species is perhaps more elegant than in any other lemur, and the vivacity and intelligence of its appearance are heightened by its white, pointed, and erect ears. In its manners also it is usually the most amiable and playful of all the lemurs, and appears to feel more affection than any of them for its master.

THE MONGOUS (*Lemur Mongoz*), is another species which is frequently brought to Europe, and indeed appears to be one of the most abundant in its native country. It is a little larger than the ring-tailed lemur, and its body is entirely clothed with a thick coat of tawny woolly hair. The sides of the face are ornamented with a pair of orange whiskers, the top of the head is black in the male, grey in the female, and the tip of the tail is also black. In speaking of the agility of this species M. F. Cuvier mentions that an individual in his possession was able to spring from the ground to the branch of a tree, at a height of at least ten feet.

The only other species of the genus *Lemur* to which we shall refer is the Pied Lemur (*L. Macaco*), which is remarkable for the distribution of its colours, consisting in large irregular patches of black and white. The tail and hands are entirely black, as are also the face and muzzle; a large black patch surrounds the shoulders and neck, and a still larger one occupies nearly the

whole of the back, leaving only a comparatively narrow white band between it and the patch on the shoulders. This is the most usual arrangement of the black and white in the pied lemur; but it varies considerably, and specimens have been seen in which only the tail, the hands, and the muzzle were black. This species appears to be of a fiercer character than most of its congeners; some French travellers declare it to be as ferocious and cruel as a tiger, and M. F. Cuvier records an instance of a pied lemur which had lived for some time on good terms with a mongous having turned upon his companion the night after a change had been made in their abode, and utterly destroyed him.

Besides these true lemurs the forests of Madagascar nourish several other species belonging to this family, which have been regarded as belonging to distinct genera. Most of them belong to the genus *Cheirogaleus*, and the most important characters by which they are distinguished from the rest of the lemurs consist in the greater roundness of the head, the comparative shortness of the muzzle, and the larger size of the eyes. The latter character would indicate a more decidedly nocturnal activity than prevails even among the lemurs.

THE CHEIROGALEUS MILII, one of the few species of this group of the habits of which we know anything, and at the same time one of the largest of them, measures about fourteen inches in length, exclusive of the tail, which is rather longer than the body; it is covered with a thick silky fur of a tawny-grey colour on all the upper parts of the body, and white beneath. Its legs are very much shorter than in the ordinary lemurs. A specimen in the menagerie of Paris passed the whole day sleeping in a nest which it made for itself with hay, and the whole night in active movement. Its agility was so great that it could spring to a height of six or eight feet. It fed upon fruits, bread, and biscuits. The *Cheirogaleus Murinus*, described long since by Brown as the *Little Macauco*, is the smallest of the Lemuridæ, its body measuring only about six inches in length; it was described by Buffon in his manuscripts under the name of the Madagascar rat.

FAMILY V.—LICHANOTIDÆ.

The preceding are not, however, the only quadrumanous inhabitants of Madagascar. The forests of that remarkable and still imperfectly-explored island, nourish another family of these animals, regarded by some writers as standing in the same relation to the lemurs as the anthropoid apes to the ordinary monkeys. These are the Indris, which are distinguished from the preceding by the presence of only thirty teeth. The anterior teeth in the lower jaw are, however, placed almost horizontally as in the lemurs.

THE INDRI (*Indris Brevicaudatus*), Plate 3, fig. 12, is exceedingly remarkable in its form, and also deserves notice from its being the largest known species of the entire group of the Prosimiæ or lemurine *Quadrumanæ*. When in an erect position the indri measures upwards of three feet in height. Its tail is exceedingly short, indeed almost rudimentary, and its hind legs very long—circumstances which render it the most

manlike of all the lemurs. Its fur is very soft, long, and thick. Its general colour is black, with the throat and buttocks whitish. In its nature the indri is described as being very gentle, and, although not remarkable for intelligence, it is said to be so far susceptible of education that the natives of Madagascar, who honour it with the appellation of the *Man of the woods*, sometimes train it to hunt, probably for birds.

If the information that we possess upon the habits of the preceding species be scanty enough, we know still less with regard to the other members of this family, which indeed are very few in number. They differ from the indri in having the tail, which in that animal is so greatly abbreviated, well developed and furred, and also in some particulars of their dentition upon which we need not dwell.

FAMILY. VI.—NYCTICEBIDÆ.

The animals of this family, which includes the greater part of the lemurine forms found out of Madagascar, are distinguished from the preceding families by the more acutely tuberculate form of their molar teeth, which must be regarded as indicative of their insectivorous habits, and from those of the following family by their having, like the lemurs, a curved claw only on the first finger of the hinder hands. In the number and arrangement of their teeth they agree with the lemurs. They are strictly nocturnal animals, and, like most other animals of similar habits, have the eyes very large. The species are found in India and Africa.

THE BENGAL LORI (*Loris gracilis*), Plate 4, fig. 13, as indicated by its name, is an Indian species. It occurs in Bengal, Assam, Silhet, and the Malayan peninsula, and also in the island of Ceylon. The lori measures about a foot in length, and is of a greyish fulvous colour, with the lower surface of the body whitish, and a white band running down between the eyes, and surrounding the nose. It has a rounded head, with small ears and a short pointed nose. Its body and limbs are slender, the first fingers of the hands are short, and the tail is altogether wanting. Its fur is very thick and soft. The habits of the loris are strictly nocturnal. They reside in large forests, usually in mountainous districts, and pass the days sleeping in the holes of trees. At sunset they come forth, and move slowly about amongst the branches, seeking their food, which consists partly of fruits and the tender leaves of trees, and partly of insects, small birds, and mice. When on the ground their long slender limbs seem unable to support them, and they move, as described by M. F. Cuvier, in a manner somewhat resembling that of a very young puppy. Hence many writers have compared them with the sloths, and it is remarkable that they exhibit an arrangement of the arteries supplying the anterior limbs somewhat resembling that which prevails in those singular creatures. M. Gervais justly compares the slow and cautious movements of the loris to the semiparalytic gait of the chameleon.

In their nature the loris are gentle and inoffensive, and not destitute of intelligence, as will be seen from the following extracts from an interesting account given by

Sir William Jones, the celebrated oriental scholar, of a specimen which lived for some time in his possession. "To me," says Sir William, "who not only constantly fed him, but bathed him twice a week in water accommodated to the seasons, and whom he clearly distinguished from others, he was at all times grateful; but when I disturbed him in winter, he was usually indignant, and seemed to reproach me with the uneasiness which he felt, though no possible precautions had been omitted to keep him in a proper degree of warmth. At all times he was pleased at being stroked on the head and throat, and frequently suffered me to touch his extremely sharp teeth; but at all times his temper was quick, and when he was unseasonably disturbed, he expressed a little resentment by an obscure murmur, or a greater degree of displeasure by a peevish cry, especially in winter, when he was often as fierce on being much importuned as any beast of the woods. From half-an-hour after sunrise to half-an-hour before sunset, he slept without intermission, rolled up like a hedgehog,* and as soon as he awoke he began to prepare himself for the labours of his approaching day, licking and dressing himself like a cat. He was then ready for a slight breakfast, after which he commonly took a short nap; but when the sun was quite set, he recovered all his vivacity. His ordinary food was the sweet fruit of this country. Milk he lapped eagerly, but was contented with plain water. In general he was not voracious, but never appeared satiated with grasshoppers, and passed the whole night whilst the hot season lasted in prowling for them. When a grasshopper or any insect alighted within his reach, his eyes, which he fixed upon his prey, glowed with uncommon fire, and having drawn himself back to spring on it with greater force, he seized the victim with both his fore paws, but held it in one of them while he devoured it."

Another species of lori (*L. tardigradus*), is found in some of the islands of the eastern archipelago, such as Java, Sumatra, and Borneo. It is rather smaller than the preceding species, and has a rudimentary tail, from which and other characters it has been regarded by some writers as forming the type of a distinct genus (*Nycticebus*). The Javanese lori has also been described as a distinct species.

THE POTTO (*Perodicticus Potto*) is the first African species of this family to which we shall refer. It is distinguished from all the rest of the Quadrumana by the rudimentary form of the first or index finger of the forehands, which is reduced to a mere tubercle furnished with a little claw. The potto is a thick-set animal, with short limbs and a long tail. Its size is about that of a small cat. Its ears are of moderate size. Its general colour is a reddish-brown, with the extremity of the tail black. M. Van der Hoeven mentions, that in two specimens observed by him, "the spinous processes of the last five cervical and of the first two dorsal vertebræ are long, and pierce through the hairy integument of the back, with a weak horny covering." The potto is a native of the forests of the coast of Guinea, especially about Sierra Leone. Like the lori,

* The individual described by F. Cuvier is said by him to have slept sitting in a crouching posture.

which it resembles much in its general characters, it is a nocturnal animal, slow in its motions, feeding partly upon fruits and tender leaves, and partly upon insects and other animal matters.

THE SENEGAL GALAGO (*Galago senegalensis*), Plate 4, fig. 14.—The galagos, which constitute the remainder of this family, are elegant squirrel-like creatures, with rounded heads, large eyes, large membranous ears, and long tails. They differ from the potto in the elongation of the tarsal portion of the foot, and in the greater development of the first finger of the hands. In their dentition and most of their other characters they agree with the preceding species. Like these they are nocturnal animals, living amongst the branches of the forests, where they prey upon small birds and insects. Fruits also constitute a portion of their nourishment.

The Senegal Galago, which is the best known species, is an elegant little creature rather larger than a squirrel, of a grey colour, with a reddish tinge on some parts, and with the lower surface paler or whitish. It inhabits a considerable portion of the African continent, occurring in Senegal, Caffraria, Abyssinia, and Mozambique. It was first discovered in the first-mentioned locality by the celebrated Adanson, who describes its habits as intermediate between those of the monkeys and squirrels. It appears from the statements of the great French voyager and of later observers, that the galagos principally inhabit the great forests of acacias which furnish the gum-arabic of commerce, and that the Moors who bring them down from their native haunts give them the name of *Gum animals*, and declare that they feed upon that substance. It appears, indeed, that they will eat gum when offered to them; but they show a very decided preference for insect food, those which have been observed in captivity being always on the watch for insects, exhibiting considerable excitement when they only hear the sounds produced by these animals, and seizing upon any unlucky victim that may come within their reach with the greatest avidity. In their native haunts they display great agility upon the trees, amongst the branches of which they are always sporting at night, springing suddenly upon their insect prey with a velocity greatly aided by the length of their hinder limbs. They nestle in holes of the trunks of trees, which they line with soft beds of grass and herbage for the reception of their young.

Several other species of galago have been described—all from the African continent. The largest is the *G. crassicaudatus*, an inhabitant of Mozambique and Port Natal, which is about the size of a rabbit.

FAMILY VII.—TARSIIDÆ.

The galagos, as already stated, are distinguished from the other members of their family by the great length of their tarsus, and the large size of their ears; in these respects they show an evident approach to the little creatures which form the present family, and which might, perhaps, be included in the same group with them without much violence to a natural system. The tarsiers, however, exhibit so many

peculiar characters, that although only a single species of the group is well-known, this may well be regarded as the type of a distinct family. The characters by which this is distinguished, independently of the elongation of the tarsus, are the presence of only two incisor teeth in the lower jaw, the uniformity of position of the four upper incisors, which do not stand in two pairs, and the existence of claws upon both the first and second fingers of the hinder hands.

THE TARSIER (*Tarsius Spectrum*), Plate 4, fig. 15, the only species of this family whose existence can be regarded as well established, is an inhabitant of several islands of the Indian archipelago, especially Celebes, Borneo, and Banea; it also occurs in the Philippine Islands and Sumatra. It is an elegant little creature, about the size of a common rat, clothed with a soft reddish-brown fur, and furnished with a long slender tail, the extremity of which is tufted. The most remarkable peculiarity in its structure is the conformation of the hinder extremities, which are of great length, and upon which this little animal is described as leaping about in the forest like a frog. The tarsi are much elongated and very slender, but the feet are considerably widened at their extremity, and the toes exhibit a singular relative proportion. The inner toe, the opposable thumb of the hind feet, is large and powerful, but its next neighbour is the shortest of all; the next toe and the outermost one are about equal in length, and that between them is the longest. By this means the foot acquires a singular bunched and deformed appearance, which, however, is probably in some way connected with the habits of the animal.

The tarsier is a gentle, inoffensive, nocturnal animal, which may be easily tamed; when it exhibits both intelligence and affection to those who have the care of it. It resides in the damp forests of the islands above mentioned, where it is said by Dr. S. Müller to frequent the tops of the trees, and its food is described by different writers as consisting partly of fruits and partly of insects. The Malays call it *Podje*, and, according to Sir Thomas Raffles, the natives of Sumatra have such a superstitious dread of it, that if they chance to see a tarsier upon one of the trees in the vicinity of their rice fields, they will immediately abandon the spot from a fear that some misfortune will otherwise befall them. The true position of this curious creature was long a matter of doubt, some authors having arranged it with the jerboas, and others with the marsupial animals.

FAMILY VIII.—CHEIROMYIDÆ.

We have already stated (pp. 15, 16) that besides the Simiæ and Prosimiæ, or, as they may be called, the Monkeys and Lemurs, two other families are commonly placed in the present order, although the peculiarities of their structure are so remarkable that their true position may still be regarded as a matter of dispute. This is especially true of the present family, which would seem to constitute a connecting link between the widely distant orders of the Quadrumana and Rodentia, partaking so much of the characters of both, as to have been placed alternately, by different zoologists, sometimes in one and sometimes in the other of those orders.

THE AYE-AYE (*Cheiromys madagascariensis*), fig. 7, the only known species of this family is, as implied by its specific name, a native of Madagascar, where it was first discovered by the celebrated French traveller Sonnerat. The name, *Aye-aye*, conferred upon it by him is said to have been borrowed from the expressions of surprise uttered by those natives to whom he showed

Fig. 7.

The Aye-Aye (*Cheiromys Madagascariensis*).

his specimen, and who had never seen such a creature before; it was, however, supposed by him to be the native name of his new-found treasure, and is now generally received as the name of the animal.

In its general appearance the aye-aye is intermediate between the galagos and the squirrels, with the latter of which animals it is placed by those zoologists who refer it to the Rodentia. When adult it measures about eighteen inches in length, and its tail almost as much more. It is clothed with a thick fur composed of two kinds of hair; a thick woolly down close to the skin, and longer smooth hairs, which form the outer coat. The general colour of the fur is a pale rusty brown, with the face and throat lighter; the tail is bushy, and the ears very large and naked. But the most remarkable characters of the animal are, as may be supposed from its doubtful position in the system, to be sought in its structure. The dentition, which, as a general rule, may be regarded as the best character by which to determine the systematic position of a mammal, would seem to indicate the justice of placing the aye-aye amongst the rodents; the incisor teeth, as in those

animals, are two in number in each jaw, long, stout, and chisel-like, and the canines are altogether deficient; but the molar teeth, four in the upper and three in the lower jaw, although arranged in the same way as in the Rodentia, present certain characters which are not usual in that order. The skull, in its form, has some analogy with that of the galagos, and the bony orbits are complete—a character which does not occur amongst the rodents.

Thus the characters to be drawn from the head and teeth leave the true position of the aye-aye still very doubtful, and it is only from the structure of the members that we are induced to place this animal with the Quadrunana. The bones of the forearms are distinct throughout their whole length, and both these and the bones of the wrist resemble those of the lemurine animals. The forehands, however, are very peculiar in their structure, the thumb is not opposable, the fingers are exceedingly long and thin, the fourth being the longest, and the third the thinnest; all are terminated by large nail-like claws. In the hinder-hands, on the contrary, there is a distinctly opposable thumb, and the claw of the first finger is evidently more elongated and awl-shaped than those of the others, in the same way as in the true lemurs. Another singular character is the position of the teats, which are situated on the groin.

The aye-aye would appear to be rare even in its native forests; only three specimens have been brought to Europe, and these are in the museum of the *Jardin des Plantes* at Paris. This rarity may, however, be due to the habits of the animal, which is a strictly nocturnal creature, sleeping during the day concealed in holes in the ground. It is described as being exceedingly sluggish, but we still know little or nothing of its general habits and food. According to Sonnerat

it is insectivorous, and employs its long fingers in drawing larvæ from their holes in the trees; but the specimens which lived for two months in his possession were fed with boiled rice, which they took up with their hands, "using the slender fingers," as Sonnerat expresses it, "in the same way that the Chinese employ their chop-sticks." Other writers have supposed the aye-aye to be a frugivorous animal, and it must be confessed that the form of its molar teeth do not indicate an adaptation to an exclusively insect diet.

FAMILY IX.—GALEOPITHECIDÆ.

Notwithstanding the singular characters presented by the animals forming this family, the last that we shall refer to the order Quadrunana, their position in the system is by no means so puzzling as that of the *Cheiromys*; in fact there can hardly be a doubt that they form a connecting link between the two contiguous orders of the Quadrunana and Cheiroptera, so that the only question is whether we shall place them with one or other of these orders, or, as has been done by Pro-

fessor Van der Hoeven, admit a distinct order for their reception. The latter course does not appear to us to be at all necessary, and we think it will be evident from the following description of the conformation of these singular creatures that their affinities are much closer to the lemurine quadrumana, than to the bats.

THE GALEOPITHECI, or *Flying Lemurs*, differ from the rest of this order in the want of opposable thumbs on all the feet, these being composed of five digits of nearly equal length, arranged in the same plane, and united to each other by a membrane (fig. 8). The limbs are rather long and slender, and on each side of the body, taking its rise from the neck and extending to the wrists, ankles, and even between the hinder limbs to the very extremity of the tail, is a broad hairy membrane, looking, at the first glance, like an ample cloak, in which the creature might wrap itself up warmly in case of need. The office of this membranous expansion is, however, very different; when in use it is widely extended by means of the limbs, and then serves its possessor in the way of a parachute, enabling him to spring from tree to tree at great distances. Hence the name of flying lemurs by which the galeopithecii are commonly known. But it must not be supposed that this action constitutes true flight; it is

Fig. 8.



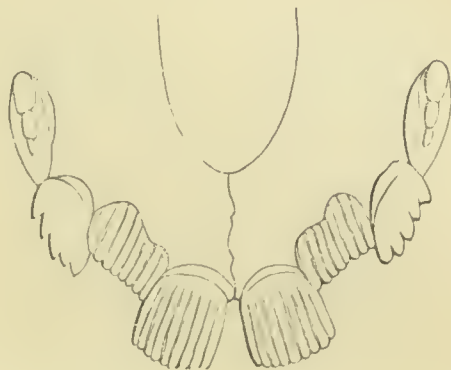
Hind foot of Galeopithecus volans.

merely a parachute-like sailing through the air; the impetus being given by the spring of the creature from an elevated position, the expanded membrane buoys it up for a considerable distance, although it has no power to sustain or elevate itself in the air by its own exertions. A similar structure, adapted to the same end, occurs in the flying squirrels, and flying phalangens, and it is widely different from the true wings by which the bats are enabled to take their swift and noiseless flights through the dusky evening air.

In the general form of the skull the galeopithecii resemble the lemurs, but the orbits are open behind as in the bats. The structure and arrangement of the teeth are, however, different from anything we meet with in any other group of mammals. The incisor teeth are four in number in each jaw, but those of the upper jaw are placed quite at the sides, in a line with

the molars, so as to leave a wide vacant space in front above the lower incisors. The hindmost of the upper incisors are also remarkable for having two roots, a

Fig. 9.



Lower incisor teeth of Galeopithecus volans.

character which does not occur in any other mammal. The lower incisors are inclined forwards as in the lemurs, broad and flat, and with their crowns curiously cleft in such a way that they resemble small combs (fig. 9); the canines are wanting in the upper jaw, small and notched at the edge in the lower one; and the molars are six in number on each side of each jaw, and sharply tubereled.

Of the other characters presented by these singular creatures we need only notice that they possess two pairs of teats, all placed upon the breast.

THE FLYING LEMUR (*Galeopithecus volans*), Plate 4, fig. 16, is a native of several of the large islands of the eastern seas, especially Java, Sumatra, and Borneo, and also of Penang, Siam, and the peninsula of Malacca on the continent of Asia. It is of a blackish-grey colour above, with some whitish spots, and of a tawny-grey beneath; its feet are blackish, and its total length about eighteen inches.

In the luxuriant forests of the countries above-mentioned, the flying lemurs exist in considerable abundance, but they are said to select particular spots for their dwelling-places, especially gentle hills covered with young trees, in the thick branches of which they find a secure retreat, and quietly sleep away their days. The night is the season of their activity, and then they may be seen springing obliquely from one tree to another, often at a distance of a hundred yards or more, at the same time uttering a hoarse, croaking, disagreeable noise. On the ground, however, they are very helpless, advancing by a succession of little awkward leaps until they reach some object which they can ascend, when they climb up by the aid of their claws, somewhat in the manner of a cat. They feed upon fruits and young leaves, preferring those of the cocoa, palm, and the *Bombax pentandrum*, to the plantations of which, surrounding the native villages, they often do much injury. According to some authors they do not adhere strictly to a vegetable diet, but feed also upon insects, and even upon small birds when they can seize them.

ORDER III.—CHEIROPTERA.

To this small and well-marked class of mammals, it must be confessed, naturalists have not given that attention which the subject demands. Though for the most part composed of individuals of comparatively insignificant bulk, they have nevertheless important claims upon our consideration, both on account of the singular and characteristic modifications of organic structure they exhibit, and in respect of the part they play in the economy of creation.

With regard to the habits of the bats and their manner of living, the first and most conspicuous peculiarity presented to ordinary observation has reference to their mode of flight, and the agency by which this function is performed. As the majority of our readers are aware, their titular name *Cheiroptera*, or Wing-handed family, points at once to the members of the body, primarily concerned in the office of flying; but while the flight of birds is immediately brought about by a development of special integumentary appendages in the form of feathers, we have here the same purpose served by a membranous extension of the skin itself. The membrane is extremely delicate and elastic, extending in front from the neck and sides of the body to the extremity of the fingers of each upper limb, and behind to the tail and to the heels of the feet. It is thus that nature displays her indefinite resources, being in no way hindered by such arbitrary laws as operate in the fabrication of works of art. Look at the character of a bat's flight. Generally speaking its aerial progression is easy, regular, and sustained. It has a velocity sufficient to insure the overtaking and capture of its swiftest insect prey; while its strength is such as to enable the maternal parent to carry one or two young ones on her back at the same time, during her passage through the air. Considering the solidity of their bony framework, and the absence of such air cavities as are found in birds, it would at first sight appear that bats have relatively a greater specific gravity than birds, and consequently a greater degree of aerial pressure to contend with. This apparent disadvantage, however, is more than counterbalanced by a proportionably greater extent of surface presented by the wings as compared with the weight of the body, than obtains in the feathered tribe. We have here in short all the essential conditions for a rapid aerial progression, namely, an appropriate form, a weak specific gravity, and a special modification of the anterior locomotive organs, forming an elastic extensile membrane. These conditions enable the Cheiroptera to realize a capacity of flight second only in degree of perfection to that of birds. In no other family of the first great division of the animal kingdom is this physiological action witnessed, unless indeed we are to exalt the leaping powers of the *Galeopithecus volans* to a species of flight. This animal, more familiarly known as the flying cat, or flying lemur, is also provided with an elastic membrane of a more limited extent than that of bats, but covering and connecting together the anterior and posterior extremities; this structure is not

only incapable of raising the creature in the air, but performs rather the office of a parachute than that of an organ of flight.

The remarkable adaptations thus rendered subservient to the purposes of flight, are further, and perhaps more cogently, illustrated by referring to the skeleton (Plate 34, fig. 110). Here we find the solid framework of the body more or less attenuated in all its elements, with the view of imparting lightness on the one hand, and of retaining strength on the other. Every bone indicates the care taken to provide against any unnecessary weight. The skull is elongated from before backwards, and its constituent parts thinned out in a striking manner; this elongation, however, is less conspicuous in those bats which feed on insects, and there are several other cranial peculiarities indicating greater strength in the insectivorous than in the frugivorous species. Among these may be mentioned an increased breadth in the form of the jaws in the carnivorous kind, this group also having the cusps of the teeth sharp and pointed, while those of the fruit-eating section are broader, blunter, and deeply grooved longitudinally. All the bats display four canine teeth, but the number of incisors and molars or grinding teeth varies considerably. Of the latter there are never less than three on either side of each jaw, while very frequently we find five in the upper and six in the lower, an arrangement which is occasionally reversed. With regard to the incisors, or cutting teeth, there are usually two or four in the upper jaw, and two, four, or sometimes six, in the inferior jaw. The backbone, or chain of bones, termed the vertebral column is chiefly remarkable for the large size of its spinal or neural canal, and the comparative breadth and strength of the bones of the neck. The vertebræ, to which the ribs are attached are eleven or twelve in number, according to circumstances; but those succeeding are more variable in this respect, from four to seven being assigned to this so called lumbar region. The bones of the tail, or coccygeal vertebræ, exhibit a still more striking irregularity, and present, as it were, a gradual dwindling away towards the delicate filamentary extremity in those species of *Vespertilio* where they are most numerous. In the genus *Pteropus*, indeed, there is no tail whatever, but in the species of *Noctula* we find six bones, while as many as twelve occur in the genus above mentioned. All the ribs, with the exception of the first pair, have an extraordinary length, relatively more, we may say, than occurs in any other mammalian family. The breastbone, or sternum, is also unusually long and broad, the anterior part, or manubrium, as it is called, having a surprising lateral expansion in certain of the genera, and most conspicuously so in the horse-shoe bats. In all the species this portion of the little flat chain of bones, collectively termed the sternum, is provided with a more or less prominent central ridge on the under surface, evidently corresponding to the exaggerated keel-like process developed in birds to give attachment to the strong pectoral muscles. We also

discover an increase of development of the other bones which enter into the constitution of the shoulder. The clavicles are elongated and much arched superiorly, the bladebone or scapula being likewise very surprisingly developed, more especially in the insect-devouring species. All these arrangements beautifully illustrate the adaptability of this mechanism to the peculiar habits of the Cheiroptera, while they at the same time afford to the unprejudiced truth-seeker the most satisfactory evidences of creative design. The teleological argument, indeed, may be still more vigorously enforced by a consideration of the osseous elements which enter into the formation of the arm, forearm, and hand. To a certain extent we have already touched upon this mechanism, when speaking of the characteristic function of flight. It is here, therefore, only necessary further to observe, that the upper extremity of the humerus or first bone of the arm is large and rounded, while the remainder is cylindrical and slender throughout. The two bones of the forearm, namely the radius and ulna, are curiously modified; the former being extremely long, and the latter only faintly represented by a slender styloform process, or in some cases by a mere rudimentary flat bony nodule. By this significant disposition of parts all rotatory motion is effectually prevented, and those movements of pronation and supination, so essential to the welfare of the human and quadrumanous species, are entirely dispensed with. Had not these changes of structure been introduced, the comfort, nay the very existence of these creatures, would have been jeopardized. Such is the foresight of the Divine Architect! And before concluding this part of the subject, we have further to observe that six small bones enter into the framework of the wrist, two behind, and four in front; one of the former row being singularly bulky, probably because two other carpal bones, usually assumed to be absent, do in reality enter into its constitution. Succeeding these are the immensely elongated metacarpals and wire-like fingers, the phalanges of which diverge from one another in the expanded condition of the wing, and spread out to reach the lower margin of the elastic skin membrane formerly described. The second digit is the shortest, and the third the longest, while the thumb is comparatively insignificant, and terminated by a hooked phalanx. Finally, the bones of the pelvis, and those of the lower limb, although they share in the general diminution of the osseous fabric quantitatively, do not in other respects relatively exhibit those deviations from the normal type of skeletal structure which obtain in the shoulder and superior extremities.

Before proceeding to consider the habits of Cheiroptera, there are several other interesting peculiarities of organization which cannot pass unnoticed. One of the most important of these is the great development of the ears among those bats living upon insects. In some species the external auricles attain a prodigious size (fig. 10), being frequently as large as the head, and occasionally nearly as long as the entire body; and this curious feature is, moreover, combined with an increased development of the internal acoustic apparatus, and a special enlargement of that part of the auditory organ termed the *cochlea*. The eyes of bats are

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small, and in those kinds which have large ears they are almost concealed from view. The skin, generally, is

Fig. 10.

Head of the Long-eared Bat (*Plecotus auritus*).

clothed with a soft downy hair, except on the winged and interfemoral expansions. The sense of smell is remarkably acute, more particularly in the insect-hunting group. Here again we find an increased development of the external organ, precisely analogous to the external ear. Certain individuals are provided with leaf-like appendages attached to the nostrils, and consequently we are fairly entitled to presume that, as in the case of hearing, the auricles are created with the obvious intention of catching sonorous vibrations, so also are the nasal leaflets designed to collect the odorous particles emitted from the bodies of the insects on which these animals prey (fig. 11). The sense of touch is likewise exceedingly sharp. For a long time

Fig. 11.

Head of the Greater Horse-shoe Bat (*Rhinolophus ferrum-equinum*).

it was a question with naturalists how the Cheiroptera regulated their flight in caves and recesses of almost absolute darkness, there being no doubt as to the well ascertained fact that their movements, under these circumstances, were conducted with the same skill, ease, and rapidity as in twilight. To solve this problem the eminent physiologist, Spallanzani, instituted a series of cruel experiments. He actually deprived a number of bats of their sight by extracting the eyes, and filling the sockets with pieces of leather. They were then

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permitted to fly about, while various obstacles were placed in their way. Even in this unhappy condition the poor creatures avoided every hinderance, knowingly turned sharp corners, and passed through threads suspended from the ceiling of an apartment, when the intervening spaces between the several cords scarcely exceeded in width the lateral diameter of the animals' bodies from wing to wing. The results of these experiments have been since confirmed. The astonishing phenomena thus exhibited at first induced Spallanzani to believe in the existence of a sixth sense, and this opinion appeared to receive general favour. It was reserved, however, for the illustrious Cuvier to suggest that the faculty in question resided in the winged and interfemoral expansions of the skin, and was immediately due to the high sensibility of that structure. This membrane was then, as now, well-known to be extensively supplied with nerves, but it still remains to be demonstrated whether these nerves terminate in special tactile corpuscles, or touch bodies, such as Wagner not long ago discovered in the tips of the human finger, or whether any other specialization of neural tissue may not be present. In the phyllostomes, or leafy-mouthed bats, the tongue presents a curious sucking apparatus, consisting of numerous processes on the surface; and these acting together enable them to draw in the juices of the animals or fruits on which they feed. In regard to the digestive organs we find modifications of structure co-ordinating with the varying characters of the teeth in the two principal cheiropterous groups. Those feeding on insects present a simple stomach, such as we see in the ordinary Carnivora, whereas this organ in the frugivorous species displays characters more in harmony with the complicated stomach of vegetable-feeding quadrupeds.

The habits of the bat family are nocturnal or crepuscular. During the day they lie concealed in dark recesses, and are to be sought for in the hollow cavities of trees, in holes of walls, and in rocky caverns; having an especial liking for ancient ruinous buildings, among whose architectural irregularities they discover most appropriate hiding-places, suspending themselves by their hind feet, the head being directed downwards. As the shadows of evening approach with gradually deepening gloom and silence, our twilight-loving friends steal forth from their various snug retreats. The soft moist air of closing day, no longer heated by the summer's sun, is favourable to the chase, while the accumulating sweetness of the balmy air, aggravated, it may be, by the occasional hum or buzz of some insect wanderer as it flits by the lonesome retreat of a half-awakening phyllostome, can no longer be resisted. The contracted crumpled-up wings are now unfolded; the drooping auricles become expanded and erect; the hour for action has arrived, and one by one each issues forth with comforting expectancy. Such being the preparatory attitude and behaviour of our aroused phyllostome, let us now direct our thoughts to the objects of pursuit—what of them? Thus may we soliloquize. Poor insects! you too have issued forth on your self-seeking errands. Hither and thither you glide on in dreamy unconsciousness of the destiny that awaits you. But in carrying out nature's provision for

your abundant increase, you have, as it were, exceeded the proper bounds. Though we acknowledge this excess is more apparent than real, you cannot entirely lay claim to our sympathy. We admit it is no fault of yours, yet, there you are, sometimes disputing possession of the air by your intolerable profusion. You have propagated too fast. Like a healthy shrub you have vegetated too actively, and, in a numerical point of view, your very budding outbids all human calculation. To us your success in this particular has become a nuisance, and our welfare is involved in your partial abrogation. I am glad to see the cheiropterous destroyers are at hand, for to them your multiplicity is an occasion of rejoicing. Talk of destruction! In early days the swift-winged arrow did its appointed work, and to-day, alas! the deadly rifle slays its numerous human victims. But watch yon tiny vespertilio, see with what skill she steers her rapid flight. One after another each fluttering victim disappears, as with sudden stroke its course is finished by the flittermouse's grasp. *Sic transit gloria insectorum*. Yet this mode of living is imposed upon the Vespertilio as a wise necessity. She not only purifies the air of superabounding insect forms, but at the same time, secures her proper sustenance; she supports her delicate fabric by the legitimate employment of her means, and accomplishes this purpose without occasioning prolonged pain or unnecessary torture. How suggestive and beautifully true to nature, therefore, are the sacred psalmist's words—"Thou openest thine hand, and fillest all things living with plenteousness."

Another habit among Cheiroptera must not pass unnoticed—we allude to *hibernation*. This remarkable state of inactivity occurs during the winter season, and is a provision of nature not so much brought about by the mere existence of cold, as by the circumstance of the supply of insect food being stopped. It is well known, indeed, that some animals belonging to the insectivorous mammalia, properly so called, hibernate in tropical countries during the summer months, for the excessive heat and dryness of the atmosphere causes the same scarcity of insect life. Whatever may be the explanation of the changes produced in animals so circumstanced, it will be readily understood that those occurring under opposite conditions must be equally astonishing. Here we have a strangely-modified existence—a meagre semblance of vitality—at the portal of whose doors death seems ever ready to enter in and claim possession. Suspended in the secret recesses of his temporary grave, our little bat experiences the chill of those coming events that cast shadows before them. But a short time since we watched his aerial flittings, as he joyously snapped up his prey; but his pastime is over, not a few insects have perished, and the larvæ of others lie buried in the earth, hoping to assume the more perfect imago form in the approaching spring. Left in this apparently forlorn condition, the bat gives itself over to a profound repose, while a series of physiological changes steal over him such as Professor Owen has thus faithfully portrayed—"The breathing becomes gradually slower than in ordinary sleep, the pulsations of the heart diminish in force and frequency, the supply of

stimulating arterial blood to the muscles and the brain is progressively reduced, relaxation of the muscular fibres is converted into stiff inaction, and sleep sinks into stupor: at length respiration entirely ceases, and with it those chemical changes in the capillary circulation on which animal heat mainly depends. The preservation of life in its passive or latent state is now due to the irritable property of the heart's fibre, which is excited to contract by the blood in its present dark or carbonized state, and continues to propel it slowly over the torpid frame during the whole period of hybernation. This slow circulation of venous blood through both the pulmonic and systemic vessels is the only recognizable vital act during that period, and the material conveyed by the absorbents into the circulating fluid is sufficient to counterbalance the slight waste thus occasioned. So long, therefore, as the state of torpidity continues, the bat is independent of supplies from without; but it purchases that independence by a temporary abrogation of its vital faculties. Cold, senseless, motionless, and asphyxiated, its entry into death's chamber is prevented only by its being brought to his very door." Such is the sacrifice which this semicadaverous state involves, yet its superinduction furnishes the means of warding off the otherwise inevitable consequence of death by starvation. On the approach of summer the vital forces resume by degrees their wonted functions, and the species again takes part in the pleasures of active life.

With all our boasted national intelligence, it is surprising to how great an extent the minds of the people are still imbued with childish superstitions. The records of our police courts have recently demonstrated the prevalent existence of this barbarous ignorance, in a manner which ought to excite the deepest national self-reproach. Even the harmless, playful, slender little bat, as it innocently chases its lawful prey, is foolishly dreaded as an ominous visitant; and when by any chance an open window gives it entrance to some airy dwelling, what consternation marks the countenances of its human occupants. Ah! exclaims one, there will soon be a death in this house. Yes! replies another, it is a warning to prepare! Stupid peasant, and yet still more senseless lady. Can you not shake off such vain associations? What is there, we ask, in these accidental domiciliary visitations to occasion mystery, horror, or alarm? Let the simple statement of these creatures' habits which we have just given, invite you to admire and caress the beings you have hitherto regarded with gloomiest forebodings.

Bats are found in all quarters of the globe. There is no considerable portion of the earth's surface which cannot produce some members of the family; but, as in quadrupeds, certain generic types are common to one country, while, on the other hand distinctive peculiarities characterize those of another. In our own islands, and in Europe, all the species are insectivorous, and most of them belong to the great family of *Vespertilionidæ*, being unprovided with those peculiar nasal leaf-like appendages formerly described. With regard to the distribution of bats in time, our readers will anticipate their recent origin in a geological point of view. The few and fragmentary remains with

which we are at present acquainted, have, for the most part, been found in the pleistocene, or newest deposits of the tertiary age. Some cheiropterous fossils found in the old caves of Kent's Hole, near Torquay in Devonshire, and in the Mendip hills of Somersetshire, are clearly referable to existing species, while those procured from the lower eocene formation at Kyson, near Woodbridge in Suffolk, and those taken from the Norfolk crag deposits, also belong to existing European genera. The fossil forms found in America appear to be connected with the comparatively recent pliocene formation. Finally, it is worthy of remark, that no remains of extinct Cheiroptera belonging to the frugivorous class are at present known.

FAMILY I.—VESPERTILIONIDÆ.

The group of individuals associated under this head do not exhibit foliaceous nasal appendages. They are all insectivorous in their habits. They display ten incisive or cutting teeth, namely, four in the upper, and six in the lower jaw. There are, as usual, four canines, but a variable number of molars or grinding teeth. The ears are not remarkably conspicuous, that is to say, very seldom longer than the head, and they are disconnected at the lower part. The fingers are unprovided with claws. The tail is generally a little exerted beyond the investing interfemoral membrane.

THE PIPISTRELLE (*Vespertilio pipistrellus*).—On the authority of the Rev. Leonard Jenyns and Professor Thomas Bell, we are entitled to consider this species as the common bat of Britain, *par excellence*. Some time ago, these gentlemen took considerable pains to show, and they moreover conclusively established the fact, that the form of bat invariably described in the older British natural history works as the common bat of our country, although extremely abundant in continental Europe, was in reality referable to a species, indigenous indeed, yet comparatively rare in this country. The bat here spoken of as scarce, is the mouse-coloured vespertilio. The pipistrelle is a diminutive creature, and is only an inch and a half in length when full-grown. Its ears have an oval-triangular form, and are about two-thirds longer than the head, being cleft at the outer margin. In a state of repose it is commonly detected in the crevices and fissures of old brick walls, and especially in all kinds of recesses connected with human habitations. Gnats and other members of the dipterous class seem to constitute its favourite food, but it would be difficult to limit its choice in this particular. Mr. White, in his oft quoted "Natural History of Selborne," gives an interesting account of the feeding of a tame bat, which in all likelihood was an example of the species we are now discussing. He says it was wont to "take flies out of a person's hand; if you gave it anything to eat, it brought its wings round before the mouth, hovering and hiding its head, in the manner of birds of prey when they feed. The adroitness it showed in shearing off the wings of flies, which were always rejected, was worthy of observation, and pleased me much. Insects seemed to be most acceptable, though it did not refuse raw flesh when offered;

so that the notion that bats go down chimneys and gnaw men's bacon, seems no improbable story. While I amused myself with this wonderful quadruped, I saw it several times confute the vulgar opinion, that bats when down on a flat surface cannot get on the wing again, by rising with great ease from the floor. It ran, I observed, with more despatch than I was aware of, but in a most ridiculous and grotesque manner." These latter remarks have received ample confirmation from the observations of several distinguished naturalists. Speaking of the pipistrelle, Mr. Bell states, as the result of his experience, that this bat is capable of running along the ground with greater celerity than any other species with which he is acquainted; whilst its power of climbing showed a "corresponding degree of agility." He adds, "I have often seen the pipistrelle rise from a plain surface with a sort of spring, instantly expand its wings, and take flight. This was repeated by a single individual several times in the course of an hour, and without the slightest appearance of difficulty or effort; it was, on the contrary, evidently a natural and usual action." The error, therefore, of the commonly-entertained notion respecting the bat's inability to rise from the surface of the ground, is clearly manifest, and if further proofs were wanting, we might furnish additional evidence to this effect from equally trustworthy sources.

THE NOCTULE (*Vespertilio noctula*).—This is commonly known as the Great Bat of Britain. It is a large species, measuring very nearly three inches in length; nevertheless, it is not, as erroneously stated in some works, the largest of our indigenous Cheiroptera, seeing it is considerably exceeded in size by the mouse-coloured bat above mentioned. The head is rounded and broad transversely; the muzzle being short, wide, and abruptly truncated. One of the most striking features in this bat, is the length and extent of the wings, measuring in the full-grown individual, while outstretched, at least fifteen inches from tip to tip. As might be expected, this large amount of wing surface gives a corresponding power of rapid flight; for the performance of this function it is, indeed, eminently distinguished, and exhibits a particular liking for the higher regions of the atmosphere, where it rapidly glides along uttering wild discordant cries. The most interesting and detailed observations on record respecting the habits of this creature, are those communicated to the Zoological Society of London by Mr. Daniell. In the published proceedings of that body it is stated, that "on the 16th of May, 1834, Mr. Daniell procured from Hertfordshire five specimens of the *Vespertilio noctula*, four females and one male. The latter was exceedingly restless and savage, biting the females, and breaking his teeth against the wires of the cage, in his attempts to escape from his place of confinement. He rejected food, and died on the 18th. Up to this time the remaining four continued sulky; but towards evening, they ate a few small pieces of raw beef, in preference to flies, beetles, or gentles, all of which were offered to them; only one of them, however, fed kindly. On the 20th one died, and on the 22nd two others, each of which was found to be pregnant with a single foetus. The survivor was tried with

a variety of food, and evincing a decided preference for the hearts, livers, *et cetera*, of fowls, was fed constantly upon them for a month. In the course of this time, large flies were frequently offered to her, but they were always rejected, although one or two May-chafers (*Melolontha vulgaris*) were partially eaten. In taking the food, the wings were not thrown forward, as Mr. Daniell had observed them to be in the pipistrelle; and the food was seized with an action similar to that of a dog. The water that drained from the food was lapped; but the head was not raised in drinking, as in the pipistrelle. The animal took considerable pains in cleaning herself, using the posterior extremities as a comb, parting the hair on either side from head to tail, and forming a straight line along the middle of the back. The membrane of the wings was cleaned by forcing the nose through the folds, and thereby expanding them. Up to the 20th of June, the animal fed freely, and at times voraciously; remaining during the day suspended by the posterior extremities at the top of the cage, and coming down in the evening to its food. The quantity eaten sometimes exceeded half an ounce, although the weight of the animal itself was no more than ten drachms. On the 23rd, Mr. Daniell observing her to be very restless, was induced to watch her proceedings. The uneasiness was continued for upwards of an hour; the animal remaining all this time in her usual attitude, suspended by the posterior extremities. On a sudden she reversed her position, and attached herself by her anterior limbs to a cross wire of the cage, stretching her hind legs to their utmost extent, curving the tail upwards, and expanding the interfemoral membrane so as to form a perfect nest-like cavity for the reception of the young. In a few moments the snout of the young one made its appearance, and in about five minutes the whole of its head was protruded. The female then struggled considerably until the extremities of the radii had passed; after which, the young one, by means of a lateral motion of its fore limbs, relieved itself. It was born on its back, perfectly destitute of hair, and blind. The mother then cleaned it, turning it over in its nest; and afterwards resuming her usual position, placed the young in the membrane of her wing. She next cleaned herself, and wrapped up the young one so closely as to prevent any observation of the process of suckling. The time occupied in the birth was seventeen minutes. At the time of its birth, the young was larger than a newborn mouse; and its hind legs and claws were remarkably strong and serviceable, enabling it not only to cling to its dam, but also to the deal sides of the cage. On the 24th, the animal took her food in the morning, and appeared very careful of her young, shifting it occasionally from side to side to suckle it, and folding it in the membranes of the tail and wings. On these occasions her usual position was reversed. In the evening she was found dead; but the young was still alive and attached to the nipple, from which it was with some difficulty removed. It took milk from a sponge, was kept carefully wrapped up in flannel, and survived eight days; at the end of which period its eyes were not opened, and it had acquired very little hair. From these observations, it is evident that the

period of gestation in the noctule exceeds thirty-eight days." According to the observations of Mr. White of Selborne, this species does not make its appearance on the wing until the latter part of April, and not after the month of July. The same authority first noticed that the body of the noctule emitted an offensive odour. Throughout Europe it may be said to be a common species. In Dr. Gray's catalogue of specimens preserved in the British Museum, this bat is called *Noctulinia altivolans*, the latter word indicating its most characteristic habit.

THE SEROTINE (*Vespertilio serotinus*).—This is a moderate-sized bat, having a length of little more than two inches and a half, exclusive, of course, of the tail. The ears are tolerably large, the body being clothed with a long, soft, downy covering of a reddish-brown colour above, and gradually shading off to an obscure yellow tint at the under part of the body. Mr. Bell says, "It appears to have very much the habit of the noctule, at least as far as regards its late appearance in the spring, and its sound and long-continued slumber. It flies from evening till morning, when the state of the atmosphere is favourable. In France, where it is far from being rare, it frequent forests, where it flies among lofty trees. It is also commonly found amongst the huge piles of wood in the timber yards of Paris, seeking its place of repose on the tops of the highest piles. With us it appears to be a rare species, not having hitherto been found anywhere but around London. Its flight is slow; it shuns society more than most other bats, being generally found either solitary or in pairs. It has only one young one at a birth—about the end of May in France, probably somewhat later in this country. It is found in Germany, Holland, France, and Switzerland." In the catalogue of Mammalia preserved in the British Museum, this species is designated *Scotophilus serotinus*.

THE MOUSE-COLOURED BAT (*Vespertilio murinus*).—There can be no doubt that this is the largest of our indigenous Cheiroptera, as it far exceeds the noctule in length, measuring three and a half inches from the muzzle to the base or root of the tail. It is, as we have before stated, a common species in continental Europe, but exceedingly rare in Britain. The head is elongated, and narrower in front than obtains in any of the foregoing species; the eyes are conspicuous, and placed well forward; the ears are broad at their base, but markedly pointed at their tips. Its habits are gregarious, and it has a special fondness for old buildings. It is a very pugnacious animal, and it may be remarked that its general appearance seems to indicate such a ferocity of disposition. Moths appear to constitute its principal insect food. In the British Museum catalogue this is also classed under the genus *Scotophilus*.

NATTERER'S BAT (*Vespertilio Nattereri*).—In accordance with a distinguishing character which more or less marks this species, Mr. Bell designates it the Reddish-grey Bat. The rules observed in naming species are of necessity very arbitrary; and although, to the eye of a well-trained practical naturalist, a variation of colour is readily appreciated, by the general observer of nature differences in this respect are easily overlooked; unless, indeed, they exhibit the most pal-

pable significance. Independent of the opportunity of variety afforded by the introduction of authors' surnames into our natural history nomenclature, it also offers an agreeable medium for diffusing the names of distinguished naturalists among those who cannot be expected to know, in all cases, to whom science is indebted for its advances in ancient or even more modern times. Thus, for the sake of illustration, it is doubtless agreeable to the general reader to be aware that the Dr. Natterer, whose name is employed in connection with this bat, was a celebrated Austrian naturalist, who greatly extended our knowledge of the animals of Germany, and who, during his travels in the comparatively new field opened up to him on the Brazilian continent, accumulated a prodigious amount of materials and facts, which have since enlarged the borders of natural history science in various departments. Having said thus much, partly by way of apology for adopting the above English specific title, we have now to observe that this species is scarcely two inches long. The head is small, as compared with the species just described, while the muzzle is pointed and narrow. The ears are about the length of the head, while the little appendage in front, looking like a second ear in some species, and called the tragus, is particularly thin and styliform. In regard to its habits but little has been noticed; nevertheless, Mr. Bell has recorded some interesting observations respecting three examples, which were obtained from one of those well-known artificial caverns in the chalk-pits at Chiselhurst in Kent. "These specimens continued alive for a short time, feeding on bits of raw meat, and exhibiting great familiarity not only towards their companions, but with myself, eating from my hand, and allowing me to meddle with them without evincing fear or anger. One of them was one morning found dead, and partially eaten by his companions; and the remaining two died shortly afterwards. They were active in their habits, running about the cage, and climbing with great agility. Their attitude when running on a plane surface was more horizontal than that of the long-eared bat, though perhaps less so than the pipistrelle, which runs along almost on its belly." Natterer's bat has hitherto, we believe, only been captured in the eastern counties of England. This species will be found in the British Museum catalogue, under the combined generic and specific name of *Myotis Nattereri*.

THE PARTICOLOURED BAT (*Vespertilio discolor*).—This is a well-marked form, and one of the most attractive of the species hitherto seen in this country. It derives its name from the peculiar mottled colour of the fur, the tips of the hairs on the back being of a light-grey colour, while their roots have a rich chestnut hue. On the under surface of the body the hairs are still variegated, but they exhibit a much lighter shade. The particoloured bat measures rather more than two and a half inches in length. The ears are of moderate size, the eyes being particularly small. Throughout Europe this species appears to be everywhere scarce, and only a single example has been taken in England. The specimen in question is now in the British Museum, and is named in the catalogue *Scotophilus discolor*. It was obtained at Plymouth.

BECHSTEIN'S BAT (*Vespertilio Bechsteinii*).—Only a single example of this elegant species has at present been procured, we believe, in this country. The specimen was captured at the new forest in Hampshire, and is preserved in the British Museum. In the catalogue it is designated *Myotis Bechsteinii*. It appears to have a decided preference for woods and thickets, and takes up its diurnal abode in hollow trees. It is somewhat exclusive in its habits, mixing only with individuals of its own kind, and then only in small companies. Bechstein's Bat rather exceeds two inches in length; the muzzle is a little attenuated and pointed, while the ears are scarcely longer than the head.

DAUBENTON'S BAT (*Vespertilio Daubentonii*).—Throughout Europe this mammal appears to have a pretty wide distribution, and in the United Kingdom it has been taken at the far north of Scotland. It is very little longer than the preceding, but the head is considerably shorter, and less pointed in front. The ears are comparatively short, and slightly notched at the external margin. Its flight is low and rapid, and it frequents the neighbourhood of still waters.

LEISEL'S BAT (*Vespertilio Leisleri*).—Mr. Bell appropriately describes this bat under the cognomen of the Hairy-armed Bat, on account of a remarkable band of hair which passes along the wing membrane at the under surface of the forearm. A solitary specimen has been obtained in this country, and is preserved in our great national museum, and recorded in the catalogue under the generic title of *Scotophilus*. Its habits and places of resort are similar to those of the above species. It is two and a half inches in length; the head is compressed and pointed anteriorly; the ears are short and broadly curved at the upper part.

THE WHISKERED BAT (*Vespertilio mystacinus*).—The masculine title in which this little animal rejoices is imparted to it on account of certain long fine hairs attached to the upper lip; and, whatever may be affirmed by the learned, we think it offers but a feeble apology for the said development. However, the bat is not proud; on the contrary, Mr. Bell avers that it is a "timid and restless species." The living specimen procured by this gentleman, instead of accommodating itself to the lively society of others of the cheiropterous family with which it was associated both in captivity and freedom, obstinately refused food and perished. Its length rather exceeds an inch and a half; the ears are not so long as the head, and they are somewhat notched at the outer margin. This bat has been taken in several of the southern counties of England.

THE BARBASTELLE (*Barbastellus communis*).—This is a very well marked bat, differing from all the preceding in several peculiarities, although it has the ordinary length of two inches. The ears are united below over the forehead, while the nostrils are situated on the upper surface of its short, truncated muzzle. The fur is darker than usual, being nearly black over the region of the spine. The ears are remarkably broad, and of a more or less quadrilateral form; they are irregularly folded at various points, and rather deeply cleft at the outer margin. The eyes are singularly minute, and seem to be almost included within the auricles. According to Mr. Bell, however, this is

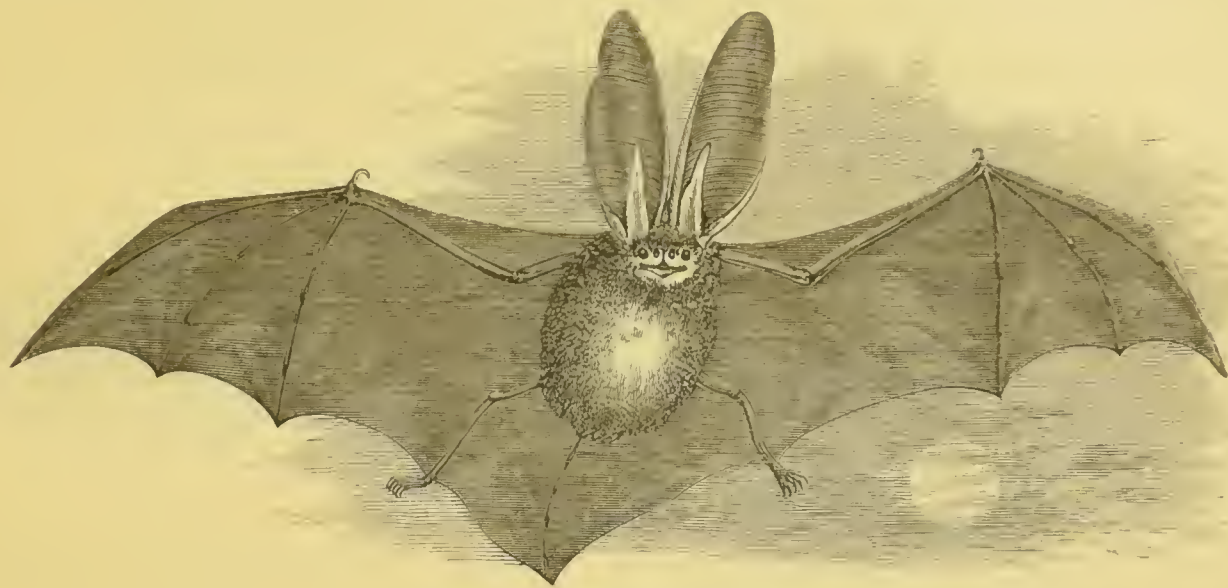
not actually the case. The eminent naturalist just named, kept a specimen in confinement for several weeks, and the account he has given of its habits are too interesting not to be recorded *in extenso*. "It was taken during a very hard frost in the latter end of December, in a large chalk cavern at Chiselhurst in Kent, which is excavated at the bottom of a shaft seventy feet deep. In this cavern, during very severe frosts, several species of bats are found to retreat; and on this occasion I received with the barbastelle a specimen of *Vespertilio mystacinus*, three of *V. Nattereri*, and several of *Plecotus auritus*. My little prisoners, when brought into a warm room, soon began to exhibit signs of vivacity; and the barbastelle, with the others, fed readily on small bits of meat and drank water. He was a timid animal, and did not evince the slightest disposition to become acquainted with me. He would take his food, however, with his companions, and was accustomed to rest with them in a cluster at the top of the box in which they were placed. The barbastelle certainly became torpid more readily than any of the others, and more completely so; but when awake, evinced extreme restlessness, and was incessantly biting with great violence at the wires of his box. When suffered to fly about the room, he flew very low, and less actively than any other under similar circumstances; and he was fond of lying before the fire on the hearth-rug, where he appeared quite to luxuriate in the warmth. Whilst the long-eared bats showed much attachment to each other, and became very familiar with me, the barbastelle remained sullen and apart, until at length I found that he was an object of persecution on the part of his more active companions, one of whom I detected in the act of giving him a severe bite on the back of the neck. This occasioned his immediate removal to another box; but this sharp discipline probably hastened his death, which took place about a week afterwards, though he continued to eat till the day before he died. The specimen was a male, and apparently an adult." The barbastelle has been frequently captured in England; but it is better known on the continent, especially in France.

THE LONG-EARED BAT (*Plecotus auritus*).—This is one of the most attractive members of the cheiropterous family, and, as its name implies, is possessed of singularly-conspicuous auricular appendages. We have purposely deferred the consideration of it until now, because it exhibits marked affinities with the family which will next occupy our attention. In this bat the ears are more than double the length of the head, and very nearly as long as the entire body, being about an inch and a half from base to apex; the tragi, or lesser ears, as they were termed by old authors, are themselves about half an inch long. It is not, however, in the mere extent of these appendages that their attractiveness is to be considered; it is rather owing to their exquisite transparency, and the power the creature possesses of expanding and contracting them in such a manner as to produce the most elegant festoon-like foldings, or, from the regularity of the flexures thus formed, ever and anon displaying a beautiful feathery appearance (fig. 12). In a state of deep repose the wings lie doubled up and concealed under

the arms, while the lesser ears, erroneously so called, still maintain their ordinary posture. When tamed—a condition which it can be readily taught to appreciate—the long-eared bat exhibits a most amiable disposi-

tion; and in these days of vivaria it would not surprise us to hear of some person who had started, what might be termed a *cheiropterarium*. It would not, however, be placed under the management of such superstitious

Fig. 12.

The Long-eared Bat (*Plecotus auritus*).

individuals as we have formerly described. Yet, seriously, if any doubt the feasibility of such a scheme, or the interest which such a step might create, let them first peruse the experiences Mr. Bell has recorded of our long-eared friends subjected to a state of captivity. He says—"I have frequently watched them when in confinement, and have observed them to be bold and familiar even from the first. They are very cleanly; not only cleaning themselves after feeding and at other times with great assiduity, but occasionally assisting each other in this office. They are very playful too, and their gambols are not the less amusing from their awkwardness. They run over and against each other, pretending to bite, but never harming their companions of the same species; though I have seen them exhibit a sad spirit of persecution to an unfortunate barbastelle which was placed in the same cage with them. They may be readily brought to eat from the hand; and my friend, Mr. James Sowerby, had one during last summer (1836) which, when at liberty in the parlour, would fly to the hand of any of the young people who held up a fly to it, and pitching on the hand, take the fly without hesitation. If the insect were held between the lips, the bat would then settle on its young patron's cheek, and take the fly with great gentleness from the mouth; and so far was this familiarity carried, that when either of my young friends made a humming noise with the mouth in imitation of an insect, the bat would search about the lips for the promised dainty." What think you of this? Let the hypercritical sceptic give his attention! Some people, we know, are shocked at the idea of making friends with what they are pleased to term a horrid bat—a creature, which, in their estimation, is almost a representation of Satan himself—a creature, say they, whose actions will not bear the light of day—an eventide wanderer, whose boon companions are "spirits of evil and goblins damned"—harpies, they say, such as "fell upon the hastily-spread

tables of Virgil's hero and his friends, and polluted, whilst they devoured, the feast from which they had driven the affrighted guests"—beast and bird united monsters, whose prerogative it is to reveal whispered utterances of secret thoughts profound! Hence! hence! ye broad-winged devils, hence! Reminiscences of dark and bloody deeds long past already overspread our frame—freezing chills now enervate and paralyze our souls! Begone, begone, revolting creatures! misshapen forms! who can doubt your horrid mission? who abide your thrice-acursed presence?

Whether real or fancied, such have been the imaginings of the ignorant and superstitious of ancient times, whilst to poet and painter alike our innocent and harmless Vespertilio has furnished ample material for mysterious and overwrought pictures. Virgil, in his third *Æneid*, represents *Æneas* and his companions as making a descent upon the coast of one of the Ionian islands. Proceeding inland, they next secured from the plains a quantity of cattle, and forthwith prepare themselves a feast, when, lo! the bats appear, and thus we may freely render into English the imaginary scene which he there depicts—"Suddenly, from the mountains, the harpies descend with terrific violence, shaking their wings, and uttering piercing cries! Our rich dainties are torn asunder and polluted by their foul grasp! We retreat under the shelter of an overhanging rock, and, relighting our fires, resolve once more to prepare the desired feast! Alas! here come the noisy crowd again, to pollute our precious booty with their hooked talons and horrid mouths! To arms! Let us wage war upon the dreadful race! Are your swords drawn? From you lofty spot *Miscus* gives the signal! The trumpet sounds! Away we rush to the attack, 'to violate with the sword these filthy birds of the sea!' All in vain! Unharm'd, with swift impetuous flight they disappear

beneath the stars, leaving our spoil half-eaten and corrupt!" Such in brief are the sentiments conveyed by the poet Virgil, who usually speaks of our cheiropterous friends as so many "dreadful and filthy birds" (*diræ obscenæque volucres*); in one place, however, a character is introduced in the form of an ill-starred prophetess, who advocates their cause, calling them "innocent harpies (insontes harpyias)."

In conclusion we may remark, that during the state of repose, the long-eared bat is generally found in old buildings and under the roofs of houses, and when on the wing it emits a sharp shrill cry. If placed on the ground, it moves forward by a peculiar jerking action from side to side, at the same time keeping the head well raised. In the published catalogue of Mammalia preserved in the British Museum, this species is denominated *Plecotus communis*.

THE SWIFT-FLYING THICK-LIPPED BAT (*Molossus velox*), Plate 5, fig. 19. This species lives on the Brazilian continent, and certain of the adjoining West Indian islands. In common with several others of the cheiropterous group inhabiting the north-east coast of South America, it is usually known as the Bull-dog Bat, but this latter term is now better understood to apply exclusively to that particular species of the so called bull dog-bats, which is indicated in the catalogue of Mammalia preserved in the British Museum under the title of *Noctilio Americanus*—a bat also obtained from the coast of Brazil. The genus *Molossus* is marked by the presence of large ears and a short head, which is abrupt and swollen at the muzzle. The tail is long, and projects beyond the square-shaped intercostal membrane. The teeth are twenty-eight in number, that is, four incisors, four canines, and five molars on either side of the upper and lower jaws.

FAMILY II.—RHINOLOPHIDÆ.

The group of bats associated under this head, though correctly separated into a distinct family, do not, in their habits at least, depart very materially from the insectivorous Vespertilionidæ already described. Their distinguishing characteristic consists in the possession of a membranous appendage, which in some species is remarkably complicated. In those instances where this membrane is double, the form of the anterior division is more or less heart-shaped, the posterior division having the aspect of an erect lanceolate leaf with the apex directed towards the forehead. The ears are invariably large, separated from one another, and destitute of that usually narrow process called the *tragus*. Occupying the situation of this latter structure, however, we frequently find a lobed and projecting membrane developed from the base of the external margin of the auricle.

THE GREATER HORSE-SHOE BAT (*Rhinolophus Ferrum-equinum*).—The family characters above given sufficiently explain the general form of the integumentary appendage which constitutes so conspicuous a

feature in this and other members of the horse-shoe bats, and imparts to them a strikingly hideous aspect (figs. 11 and 13). The greater horse-shoe bat is about

Fig. 13.

The Greater Horse-shoe Bat (*Rhinolophus ferrum-equinum*).

two-and-a-half inches long, exclusive of the tail. The head is elongated and swollen towards the muzzle; the anterior leaf-like appendage embraces the nostrils, and has the remarkable horse-shoe shape from whence the English name is derived. Between this and the posterior lanceolated appendage, there is a cup-shaped cavity surmounted by a sort of overlapping crest. With respect to the use of these complicated structures, various suggestions have been offered; but on the whole, as we have already hinted, they are rather to be regarded as extensions of the smelling surface, with the view of accumulating odorous particles, than as subserving any other office. In concealment this bat is only found in the very darkest and most gloomy recesses, where the light of day can gain no access, and where a noiseless solitude reigns supreme. Natural caverns among rocks, or subterranean chambers artificially hewn out in quarries now long ago forsaken, are its loved retreats. From these situations it issues forth to seek its twilight repast on maychafers and their insect associates.

THE LESSER HORSE-SHOE BAT (*Rhinolophus hipposideros*).—Both this and the foregoing are European species and found in England, though neither of them can be said to be very common. At one time the present species was supposed to be only a variety of the greater horse-shoe bat; but naturalists no longer entertain any doubts as to their respective distinctness from one another. One of the principal marks by which this form is distinguished, consists in the presence of an additional filiform nasal appendage placed immediately in front of the ordinary lanceolate process which occupies the frontal region. On account of this structure, the eminent zoologist Geoffroy named the species *Rhinolophus bihastatus*, while to the greater horse-shoe bat he applied the specific title of *Rhinolophus unihastatus*. In other structural particulars, and in their habits, the two kinds bear a very close resemblance.

THE NOBLE HORSE-SHOE BAT (*Rhinolophus nobilis*).—This is one of the largest and rarest individuals of the horse-shoe family, measuring four inches in length, and having from tip to tip of the wings a lateral expansion of nearly twenty inches. It was first described by Dr. Horefield, who informs us that in the native language of the Javanese it is termed *Kébbélék*. The body is clothed with a soft downy covering, the hairs of the fur being extremely fine and long. According to Mr. Ogilby's description, the "nasal apparatus consists of a broad membrane, stretching transversely across the nose in the form of a shelf. The sides are bounded by several parallel folds, and inferiorly it constitutes a semicircular envelope, which has a short obtusely rounded point in the middle." The colour is brownish above and greyish beneath. In the British Museum catalogue it is designated *Hipposideros nobilis*.

FAMILY III.—PHYLLOSTOMIDÆ.

The Phyllostomes are, in common with the preceding family, possessed of complex nasal appendages. The typical species have four incisors in each jaw, of which the lower are very small, and are placed quite in front of the four canines. The latter are remarkably large, the number of the molars being variable, though there are generally five on either side of each jaw. The tongue is flat, elongated, and extensile, and clothed with papillæ in such a manner as to produce a kind of sucking organ, the lips being also provided with rows of regularly-disposed tubercles. The ears are of moderate size, and furnished with a tragus. The forefinger is composed of two phalanges, and the middle finger of four. They have very considerable power of running along the ground. The tail is generally short. In some instances it is altogether absent.

THE VAMPIRE BAT, (*Phyllostoma spectrum*), Plate 5, fig. 18.—Few members of the great mammalian series have excited more interest than this celebrated bat. From the earliest times its blood-sucking qualities have been memorialized; and there can be little doubt, as will be presently shown, that its propensities in this respect are truly formidable. In seeking food they appear willing to attack any description of animal coming within their reach; exhibiting, however, a special fondness for the blood of cattle, upon which they fasten themselves while their victims are asleep. Compared with many others of the bat family, it is a huge creature, about the size of a magpie, and measuring upwards of two feet from the tip of one wing to the other. With regard to the various accounts given by travellers as to their ferocious and sanguivorous habits, we prefer to select the authentic statements of Mr. Stedman, who was himself bitten by a vampire, not only on account of their circumstantiality, but also because of the apparently trustworthy source from which they proceed. Captain Stedman thus speaks of these vampires:—"Knowing by instinct that the person they intend to attack is in a sound slumber, they generally alight near the feet, where, while the creature continues fanning with its enormous wings, which keeps one cool, he bites a piece out of the tip of the great toe, so very small, indeed, that the head of a

pin could scarce be received into the wound, which is consequently not painful; yet through this orifice he continues to suck the blood until he is obliged to disgorge. He then begins again, and thus continues sucking and disgorging till he is scarcely able to fly; and the sufferer has often been known to sleep from time into eternity. Cattle they generally bite in the ear, but always in places where the blood flows spontaneously. Having applied tobacco-ashes as the best remedy, and washed the gore from myself and my hammock, I observed several small heaps of congealed blood all round the place where I had lain upon the ground, on examining which, the surgeon judged that I had lost twelve or fourteen ounces during the night." Whatever may be thought of this narrative, it seems generally agreed, that while certain of the Phyllostomata live principally on the juices of fruits, there are others that have a special appetite for the blood of the higher animals, and even of man himself. From this circumstance it would mainly appear, that the supposed existence of certain imaginary spectral monsters, termed vampires, which, in all ages, have been believed in and dreaded by the superstitious, has its origin in the actual mode of life displayed by these creatures. A distinguished writer has observed that, "upwards of a century ago, there prevailed in several districts of Hungary an epidemic dread of vampires, which lasted some years, and gave birth to many extraordinary stories. It was believed that in several places, those among the dead who belonged to the class of vampires, arose nightly from their graves and sucked the blood of the living, who fell into consumptions and perished; that those who had died in this manner became infected with vampirism; and that the only way of exterminating the plague was by disinterring all the suspected vampires, and, if it were discovered that they exhibited the tokens of their hideous character, burning them to ashes, or driving a stake through their middle. The attestations which these grotesquely fearful tales received, are among the most singular instances of human credulity recorded in all the annals of superstition. They are, in many instances, related on the authority of the pastors, and other most credible persons of villages and towns, who depose to having been themselves witnesses of the scenes beheld on opening the vampires' graves. Some, indeed, had actually seen the spectres themselves on their nightly excursions; but more generally the subscriptions are by persons present at the inspection of the dead bodies; when, if the subject was a true vampire, he was generally found of a florid and hale complexion; his hair, head, and nails had grown; his mouth, hands, *et cetera*, were stained with fresh blood; his eyes open and brilliant. Sometimes when the stake was driven through him, he was heard to utter cries like those of a living person. It was believed that the consumption produced by the sucking of the vampire could be cured by eating earth from his grave." Such is a specimen of the follies displayed by the profoundly ignorant and superstitious. Surpassing strange it is, that intellectual human beings can be sufficiently debased to allow a suggestive idea to gain such entire possession of the frame. That many of the parties believed what they

stated to be strictly true, we have no manner of doubt; for the phenomena of mental aberration thus produced, are strictly analogous to those cerebral manifestations which a weak mind exhibits when allowed to be under the controlling power of another. This is the true solution of mesmerism, as the writer of this article can confidently state, from having experienced on his own person all the ordinary mental changes, absurdly termed electro-biological, sometimes voluntarily forced upon the mind by his own ideal associations, at other times superinduced by submission to a so-called mesmerist. It were well if these practices and their kindred superstitions could be eternally abandoned by the ascendancy of a strong-minded intelligence, coupled with a due supply of common sense; and thus shall humanity rejoice in the possession of the *mens sana in corpore sano*. In some parts of Europe, even at the present day, vampires are believed in, and this is particularly the case in the island of Crete, where the spectres are termed Katakhanàs. The Phyllostome, captured by Mr. Darwin while it was engaged in removing blood from the neck of a horse, is, we believe, referable to this genus.

THE AFRICAN LEAF BAT (*Megaderma frons*).—

The members of this genus were formerly classed with the Vespertilionidæ proper, but their affinities connect them more closely with the present family. In many respects they differ from the typical Phyllostomata. They have no cutting teeth in the upper jaw, though in the lower they have the typical number. They have, it is true, the usual four canines; but of the molars there are only four on either side of the upper, and five on either side of the lower jaw. The membranous apparatus of the nose is complicated, there being three distinct leaflets, "one vertical, one horizontal, and one inferior of the horse-shoe form." The ears are particularly striking, being ample, oval, furnished with a tragus, and so united over the region of the forehead as to impart a heart-shaped outline to the

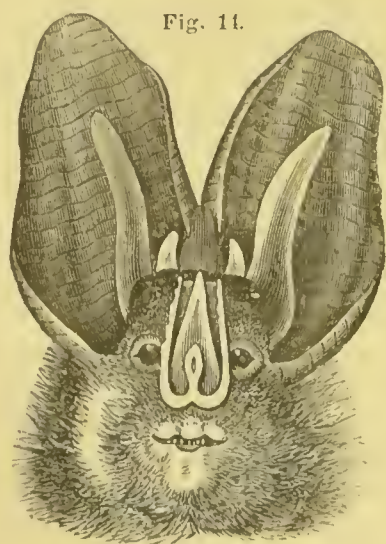


Fig. 11.

Head of the African Leaf Bat (*Megaderma frons*).

entire physiognomy, more conspicuously, perhaps, than obtains in any other species (fig. 14). The Megaderms are also blood-suckers, and it is probable that their power of suction is facilitated by the absence of incisive teeth in the upper jaw; indeed, the very

bones themselves—i.e., the intermaxillaries—in which the incisives are normally implanted, are only represented in this genus by a minute cartilaginous plate. The Megaderms are confined to the Eastern hemisphere. This species is obtained from Senegal and Gambia on the coast of New Guinea, West Africa. In the catalogue of bats contained in the British Museum it is marked *Lavia frons*.

FAMILY IV.—PTEROPIDÆ.

The bats classed together under this common title are significantly distinct both in habits and structure. They are almost exclusively frugivorous. Their heads are elongated and hairy. The grinding teeth have flattish tuberculated crowns, with a central longitudinal groove. The ears are not furnished with a tragus. The fore-finger consists of three phalanges, and is seldom armed with a claw. The tail is frequently wanting, or, when present, very short; the abrogated interfemoral membrane being represented by narrow folds connected with the inner margin of the legs. These bats have a wide geographical distribution over the Eastern hemisphere.

THE KALONG (*Pteropus edulis*), Plate 5, fig. 17.—

This is one of the best known, and at the same time the largest of the frugivorous bats. The body is about two feet long, while the expanse of the wings from tip to tip is sometimes fully five feet. It is gregarious in its habits, and extremely numerous in the islands of Sumatra and Java; and to those whose livelihood depends upon the culture of fruit gardens, it proves an incorrigible enemy. The graphic account given by Dr. Horsfield merits special quotation, containing as it does almost all that we know of their destructive propensities, and the plans adopted to secure immunity from their attacks:—"Numerous individuals select a large tree for their resort, and, suspending themselves with the claws of their posterior extremities to the naked branches, often in companies of several hundreds, afford to a stranger a very singular spectacle. A species of fig, in habit resembling the *Ficus religiosa* of India, which is often found near the villages, affords them a very favourite retreat, and the extended branches of one of these are sometimes covered by them. They pass the greater portion of the day in sleep, hanging motionless; ranged in succession, with the head downwards, the membrane contracted about the body, and often in close contact, they have little resemblance to living beings; and, by a person not accustomed to their economy, are readily mistaken for a part of the tree, or for a fruit of uncommon size suspended from its branches. In general, these societies preserve a perfect silence during the day; but if they are disturbed, or if a contention arises among them, they emit sharp piercing shrieks; and their awkward attempts to extricate themselves when oppressed by the light of the sun, exhibit a ludicrous spectacle. In consequence of the sharpness of their claws, their attachment is so strong that they cannot readily leave their hold without the assistance of the expanded membrane; and if suddenly killed in the natural attitude during the day, they continue

suspended after death. It is necessary, therefore, to oblige them to take wing by alarming them, if it be desired to obtain them during the day. Soon after sunset they gradually quit their hold, and pursue their nocturnal flight in quest of food. They direct their course by an unerring instinct to the forests, villages, and plantations, occasioning incalculable mischief, attacking and devouring indiscriminately every kind of fruit, from the abundant and useful cocoa-nut which surrounds the dwelling of the meanest peasantry, to the rare and most delicate productions which are cultivated with care by princes and chiefs of distinction. By the latter, as well as by the European colonists, various methods are employed to protect the orchards and gardens. Delicate fruits, such as mangoes, jambus, lansas, *et cetera*, as they approach to maturity, are ingeniously secured by means of a loose net or basket, skilfully constructed of split bamboo. Without this precaution little valuable fruit would escape the ravages of the kalong. There are few situations in the lower parts of Java in which this night wanderer is not constantly observed; as soon as the light of the sun has retired, one animal is seen to follow the other

at a small but irregular distance, and this succession continues uninterruptedly till darkness obstructs the view. The flight of the kalong is slow and steady, pursued in a straight line, and capable of long continuance. The chase of the kalong forms occasionally an amusement of the colonists and inhabitants during the moonlight nights, which in the latitude of Java are uncommonly serene. He is watched in his descent to the fruit trees, and a discharge of small shot readily brings him to the ground. By this means I frequently obtained four or five individuals in the course of an hour." Several other species of this remarkable genus are known, and in the year 1855 we had an opportunity of watching the behaviour of a specimen of *Pteropus edulis* in the collection of the Zoological Society, Regent's Park. Notwithstanding, however, the great care taken to keep it alive by the necessary degree of artificial heat, our treacherous climate proved too much for it. Still more recently the society procured a living example of an allied species, namely, the Shoulder-knot Bat (*Epomorphorus Whittii*) from West Africa; but this has likewise perished. These bats fed principally upon raisins.

ORDER IV.—INSECTIVORA.

SETTING aside for a moment the remarkable deviations of structure witnessed in the formation of the wings and nasal appendages in the preceding order, we appear to pass by a very natural transition to the insectivorous mammalia, properly so called, at least, when departing from the insect-feeding series of the bat family. Baron Cuvier, be it observed, placed the Cheiroptera at the head of his third great order of unguiculated quadrupeds, collectively termed *Carnassiers*; regarding the few frugivorous bats then known as aberrant departures from the real carnivorous type. As, however, the principal point of similarity connected with these groups consists in the cutting character of the grinding teeth, it will be understood that many other structural considerations, of equal importance in the eyes of naturalists, have determined the propriety of treating certain insectivorous mammals under a separate order. Professor Owen, as we have seen, even places both the Cheiroptera and Insectivora in his lissencephalous subclass—an arrangement which, based on cerebral characters, separates these orders still further from the true carnivora, and brings them nearer the rodentia. The insect-eating bats also resemble the order at present under consideration, by their conical elevations on the molar teeth, while many of the insectivora likewise hibernate, passing the winter in a torpid state. A common character, prevailing more or less throughout the entire order, is noticed in the remarkable uniformity pervading the whole dental series, rendering it at first sight somewhat puzzling to recognize and separate the teeth into their ordinary triad divisions—incisives, canines, and molars. In the more typical forms the canines assume their ordinary conspicuity, being also widely separated from each other, while the incisives are correspondingly small

In some members the dental characters approximate towards the Rodentia by the elongated form of the anterior incisors, the remaining cutting teeth, together with the canines, being even shorter than the molars. Certain of the Quadrumana also have a dentition very like this. The head is lengthened, and its constituent bones more slender than in true Carnivora. Another cogent difference from the last-named family lies in the presence of well-developed collar bones or clavicles, which are only occasionally seen in the carnivorous mammalia in a very rudimentary condition. The limbs of Insectivora are generally short, and, with one or two notable exceptions, rather feeble; the feet are furnished with five toes, and in walking the whole sole or palm is applied to the ground, forming a characteristic mode of progression termed *plantigrade*, and shared by a large section of the Carnivora proper; the under surfaces of the feet are also consequently destitute of hair. The lateral integumentary expansions seen in Cheiroptera have entirely disappeared, while the nature of the epidermal covering varies considerably in different genera; the tail is sometimes very short. In this order there is no cæcal appendage to the large intestine. The two mammæ are situated on the abdominal surface. The various species feed principally upon insects, and like the bats are frequently nocturnal and subterranean; a few of them have arboreal habits.

FAMILY I.—TALPIDÆ.

The group of species associated under this title are familiarly termed Moles; and although, on a superficial examination, there does not appear much to invite us to the contemplation of their structural and functional

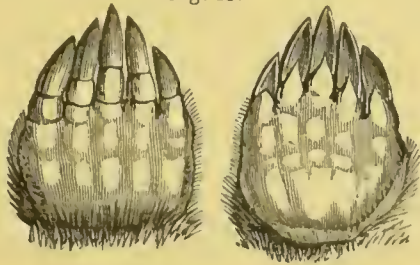
peculiarities, yet, we venture to assert, if any one will undertake to make a close acquaintance with their anatomy, that of all known animal beings, man alone excepted, none will prove more interesting in a structural point of view; and further, none will furnish more striking and incontrovertible evidences of the truthful doctrine of final causes, and the consummate wisdom of creative skill. It is well known these creatures enjoy a subterranean mode of existence, and it cannot but delight the high-souled teleologist when he perceives that their entire organization is beautifully adapted to, and eminently qualifies them for, such a habit of life. These adaptations are well seen in the skeleton, and selecting that of the common mole (Plate 33, fig. 104), the first peculiarity which meets the eye is the apparent length of the osseous framework—a result which arises rather from the shortness of the limbs and elongation of the head than from attenuation of the body itself. The bones of the neck, A, have very strong transverse processes, for the attachment of muscles; but the second cervical vertebra only is provided with a superior spinous process, to the extremity of which there is articulated a long slender osseous style, which is called the nuchal bone. Altogether there are forty-three vertebræ, that is, seven cervical, fifteen dorsal, B, six lumbar, C, three sacral, D, and twelve caudal, E. The several bones of the head are very early consolidated together, while the nasal cartilage extends forward in front to support the long projecting muzzle. The ribs have a tolerably uniform length, a circumstance which helps to impart a cylindrical aspect to the skeleton. The long narrow bones of the pelvis exhibit a similar appearance of being drawn out, as it were, from end to end. In regard to the hinder extremities, perhaps the only points worthy of remark refer to their general shortening, and the union of the tibia and fibula at the lower third of the leg; in the bones of the foot there is a supplementary tarsal segment of considerable size, assuming in the prepared skeleton the character of a sixth toe. It is, however, in the constitution of the anterior extremity that the most extraordinary skeletal deviations are witnessed, these being well calculated to excite astonishment. The sternum, though not usually described in connection with the bones of the fore limb, is here so intimately associated with the prodigious muscular developments attached to it and rendered necessary to move the arms, that hitherto we have purposely passed it over. It is a very large bone, and the anterior portion or manubrium, as it is called, is excessively prominent, serving to support the collar bones and the first pair of ribs. The clavicles are remarkably short, thick, and of a quadrate form; they form a strong *point d'appui* for muscular action. The scapula or shoulder-blade, on the other hand, is extremely long, and correspondingly narrowed—more resembling, in fact, one of the ordinary cylindrical bones of the limb than its normal characteristic flatness. The humerus or arm-bone proper is, however, the most strangely altered of all, having not only lost the usual elongated character so constant in quadrupeds generally, but presenting an oddly-contorted and jagged outline, utterly incomparable to that seen in any other family. Yet,

in all its typical constituent parts, it is a veritable humerus, and by its very abnormality demonstrates how strictly nature adheres to a given archetypal plan, even when the exigencies of the individual seem to require the introduction of a supernumerary element of strength. Observe the remarkable conformity to type. This bone presents an irregularly square-shaped form, and is somewhat compressed laterally. Unlike any other humeri with which we are acquainted, it has two widely separated and distinct articular facets at the superior end; one being articulated to the clavicle, the other to the bladebone. A still more manifest reversion of the ordinary state of things is seen in the situation of the elbow-joint, which, instead of occupying its relatively inferior position, is actually placed on a higher level than the shoulder-joint; and as the limb is turned and fixed in a semi-prone attitude, the palm of the hand is consequently directed outwards and backwards. The bones of the forearm, or radius and ulna, also take part in these abnormal dispositions; the head or upper end of the former assuming a hooked character, while that of the latter is also greatly enlarged. By these arrangements strength is imparted, and all rotation of the limb prevented. There are no less than eleven bones belonging to the carpus or wrist; they are placed in two rows, five in each, while the eleventh is attached to the lower extremity of the radius; this latter is sabre-shaped, and converges outwards towards the lower end of the metacarpal bone of the thumb, giving increased breadth to the spade-like hand. The digital phalanges of the first two rows are particularly short and broad, the terminal series being elongated, pointed, and curved inwards towards the palm. In addition to these skeletal characters, there are others of equal importance, when considered in the light of a family definition. In the typical forms the teeth are forty-four in number, of which there are fourteen incisors, six above and eight below, no true canines, and thirty molars, seven on either side of the lower jaw and eight similarly disposed in the upper; the anterior pair functionally representing the absent canines. The genera *Chrysochloris* and *Condylura* exhibit a slight departure from this dental formula. The moles have no external auricles; the eyes are very small, the feet being pendactylous and armed with strong claws; the tail is usually short. Speaking generally, they have a stout thickset appearance; but this is chiefly due to their large fleshy muscles and fatty accumulations, which are also covered by a dense, smooth, furry coat of close-set hair.

THE COMMON MOLE (*Talpa Europæa*)—Plate 6, fig. 22.—Every rustic is familiar with the habits and oblong form of this little mammal, which measures five inches in length, not including the tail. Destined to pursue its prey beneath the surface of the earth, it is surprising, considering the dense nature of the medium, that it should be able to swim, as it were, through the very soil with a rapidity perfectly astounding. We have already partially unravelled the nature of the mechanism by which these movements are accomplished in our description of the skeleton; but there still remains to be noticed in particular, the scoop-like configuration of the hands, which are convex

on the back, and shallowed out at the palm (fig. 15). Every finger is armed with a strong pointed nail, grooved on the under surface, while all of them converge together at the tips, forming a powerful kind of digger or

Fig. 15.

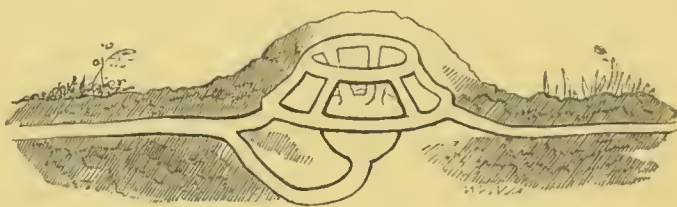


Front and back view of the hand or fore-foot of the Mole (*Talpa Europaea*).

hoc. Of our more common animals, few have had their behaviour and manner of living more thoroughly exposed than the mole. Pennant, speaking of its powers of progression, says—"The breadth, strength, and shortness of the fore feet, which are inclined sideways, answer the use as well as the form of hands, to scoop out the earth to form its habitation, or to pursue its prey. Had they been longer, the falling in of the earth would have prevented the quick repetition of its strokes in working, or have impeded its course; the oblique position of the fore feet has also this advantage, that it flings all the loose soil behind the animal. The form of the body is not less admirably contrived for its way of life; the fore part is thick and very muscular, giving great strength to the action of the fore part, enabling it to dig its way with great force and rapidity, either to pursue its prey or elude the search of the most active enemy. The form of its hind parts, which are small and taper, enables it to pass with facility through the earth that the fore feet had flung behind; for, had each part of the body been of equal thickness, its flight would have been impeded, and its security precarious. The skin is excessively compact, and so tough as not to be cut but by a very sharp knife; the hair is very short and close set, and softer than the finest silk; the usual colour is black, not but there are instances of these animals being spotted, and a cream-coloured breed is sometimes found in dry lands near Downing. The smallness of the eyes (which gave occasion to the ancients to deny the sense of sight) is to this animal a peculiar happiness; a small degree of vision is sufficient for an animal ever destined to live under ground. Had these organs been larger, they would have been perpetually liable to injuries by the earth falling into them; but nature, to prevent that inconvenience, hath not only made them very small, but also covered them very closely with fur. To make amends for the dimness of its sight, the mole is amply recompensed by the great perfection of two other senses, those of hearing and smelling; the first gives it notice of the most distant approach of danger; the other, which is equally exquisite, directs it in the midst of darkness to its food; the nose also, being very long and slender, is well formed for thrusting into small holes in search of the worms and insects that inhabit them. These gifts may with reason be said to compensate the defect of sight, as they supply in this

animal all its wants, and all the purposes of that sense." But the most interesting researches concerning this extraordinary creature, are undoubtedly those of the French writer—Henri le Court. This indefatigable observer pointed out that the mole pushes its way through the soil, not at mere random, in any chance direction; but having selected certain localities or hunting grounds, as they have been called, constructs a habitation or fortress. This is sometimes formed "under a considerable hillock raised in some secure place, often at the root of a tree, under a bank, or any shelter that offers protection. The fortress is domed by a cement, so to speak, of earth, which has been beaten and compressed by the architect into a compact and solid state. Within, a circular gallery is formed at the base, and communicates with an upper smaller gallery by five passages, which are nearly at equal distances (fig. 16). Within the lower and under the upper of these galleries is the chamber or dormitory, which has access to the upper gallery by three similar passages. From this habitation, we should here observe, the high road, by which the proprietor reaches

Fig. 16.



Fortress or habitation of the common Mole.

the opposite end of the encampment, is prolonged, while the various galleries or excavations open into this road, which the mole is continually carrying out and extending in its search for food, and which has been termed its hunting ground. But to return to the chamber: from it another road extends, the direction of which is downwards at first, and that for several inches, when it again rises to open into the high road of the territory. Some eight or nine other passages open out from the external circular gallery, but the orifices of these never come opposite to the passages which connect the external gallery with the internal and upper gallery. The extent of these passages is greater or less according to circumstances, and they each return by an irregular and semicircular route, opening at various distances from the habitation into the high road, which differs considerably from all the other passages and excavations, both in construction and with regard to the use to which it is applied. From the habitation this road is carried out nearly in a straight line, and forms the main passage of communication between the habitation, the different portions of the encampment, and the alleys leading to the hunting ground, which open into it on each side. In diameter it exceeds the body of the mole, but its sides will not admit of two moles passing each other. The walls, from the reiterated pressure of the mole's sides against them, become smooth and compact, and its course is remarkable for the comparative absence of molehills, which are frequent in connection with the alleys and

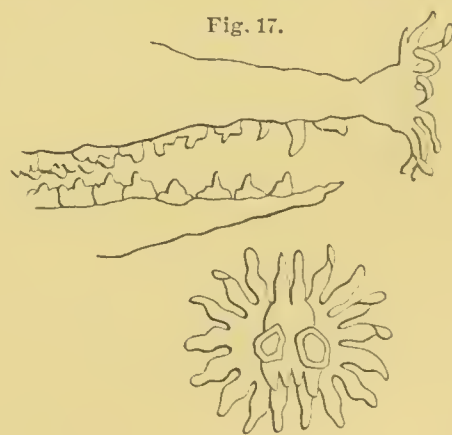
quarries, as they have been termed, in constructing which the earth is removed out of the way to the surface. Sometimes a mole will lay out a second or even a third road, in order to the extension of its operations. Sometimes several individuals use one road in common, though they never trespass on each other's hunting grounds. In the event of common usage, if two moles should happen to meet, one must retreat into the nearest alley, unless both should be pugnacious; in which case the weakest is often slain. In forming this tunnel, the mole's instinct supplies the place of science, for he drives it at a greater or less depth, according to the quality of the soil or concurrent circumstances. When there is nothing superincumbent threatening a disturbance of its security, it is often excavated at a depth of some four or five inches; but if it is carried under a road or a stream, a foot and a half of earth, sometimes more, is left above it. Thus does the little animal carry on the subterraneous works necessary for his support, travelling, and comfort; and his tunnels never fall in. The alleys opening out from the sides of the high road have generally a somewhat downward inclination, from their commencement towards their end. It has been observed, that when on opening one of these alleys, a plentiful supply of food is found, the mole proceeds to work out branch-alleys from its termination, upheaving new molehills as it advances in quest of prey. Should, however, the soil be barren of the means of existence, the animal commences another alley at a different part of the high road. The quality and humidity of the soil, which regulate the abundance of earthworms, determine the greater or less depth of the alleys. The mainroad being the highway of communication to its different hunting grounds, it is necessarily passed through regularly in the course of the day, and it is in this road that the molecatcher sets his traps, or practises his devices to intercept the animal between its habitation and the alley where it is carrying on its labours. Some molecatchers will tell you that the hours when the moles move are influenced by the tides; to which statement the reader is at liberty to give as much credence as he chooses. Besides the various traps which are set for them, there is, or very lately was, a man who travelled the country with a dog, and destroyed them without any trap at all, by the following process:—Taking his station at the proper time and place, attended by his dog, and armed with a spear or spud, he waits till the dog indicates the presence of the mole, and then spears or spuds the animal out as it moves in its run. Pointers will stop at moles as steadily as at game, when the former are straying on the surface." So much for the observations of Le Court, quoted by Ogilby, whose description appears to have been borrowed from Geoffroy St. Hilaire's abridged account of the original discoveries, as recorded in his "*Cours d' Histoire Naturelle des Mammifères*." The mole is an extremely voracious animal, and it would further appear from Le Court's investigations, that its appetite is exalted into a regular passion, which occasionally rises to such a pitch that the desire is accompanied with violent excitement. A species of madness seems to take possession of the entire frame, as it furiously

rushes upon its prey. Its food is exclusively animal. It is true, and worthy of remark, that this point has been a subject of dispute, but the united testimony of several distinguished naturalists, has conclusively shown that the vegetable debris sometimes found in its stomach, must be regarded as mere accidental accumulations, consisting of fragments of roots and other vegetable matters, which have been swallowed along with its appropriate insect food. After advancing some very acute reasonings on this subject, Mr. Bell remarks, that "the principal object of its search is the earthworm. In pursuit of this, its favourite food, it occasionally follows it towards the surface with such eagerness, that it actually throws itself out of its burrow upon the ground. It has been stated that the mole will not eat the larvæ of the Searabæidæ and other coleopterous insects that live under the ground; but this is certainly a mistake, as these larvæ have been found in their stomach. It is not, however, to these and similar kinds of food that the mole is necessarily restricted; a mouse or a bird, a lizard or a frog, if placed within its reach, becomes a speedy victim to its voracity. Toads, however, it rejects even when famishing with hunger, probably on account of the acrid secretion of the skin, first noticed by Dr. Davy. Geoffroy gives a curious picture of the manner in which it will approach, seize, and devour a small bird—exhibiting, in the first place, a considerable exercise of stratagem to get within reach of its victim, and changing on an instant this mode of approach for the most sudden and impetuous attack; seizing the hapless bird by the belly, tearing it open, thrusting its muzzle amongst the entrails, where it appears to luxuriate on its bloody repast. Even the weaker of its own species, under particular circumstances, are not exempted from this promiscuous ferocity; for if two moles be placed together in a box without a very plentiful supply of food, the weaker certainly falls a prey to the stronger. No thorough-bred bulldog keeps a firmer hold of the object of its attack than the mole. Mr. Jackson, a very intelligent molecatcher, says that, when a boy, "his hand was so severely and firmly laid hold of by one, that he was obliged to use his teeth in order to loosen its hold. It is not only in the warm and temperate seasons of the year, when the food of the mole is of comparatively easy access and exists in great plenty, that its labours are steadily and regularly followed; in the winter, when the frost has penetrated deeply into the soil, and the ordinary hunting grounds are rendered useless and impracticable, it descends to a considerable depth by a perpendicular shaft, till it arrives at the part to which the earthworms have been driven by the cold. Here its labours must be even more toilsome and less productive than ordinary; but the voracity of this indefatigable gourmand must still be appeased: and as it lays up no store for the winter, and cannot fast with impunity for more than a few hours, it may well be imagined how incessantly and laboriously it must work in such a season, and at so great a depth, to obtain a sufficient supply of worms to satisfy its insatiable craving. This rage of hunger alternates with the most profound repose, which the animal enjoys either within its fortress, during the sea-

son in which that domicile is occupied, or in a simple molehill devoted to this purpose, during the summer. Its bed is formed of various vegetable matters, such as grass, leaves, or similar soft substances. It sleeps for about four or six hours at a time in warm weather, and principally during the day—its usual working time being very early in the morning and at night. In the spring the mole leaves the fortress, and does not return to this shelter until the autumn, when it does not generally reoccupy the same edifice, but constructs another, leaving the old one to the occupation of the fieldmouse, or other small animal of similar habits. During the month of June, or longer, it is in the habit of leaving its runs, and wandering during great part of the night on the surface of the land in search of its food." There is also another mode which the mole adopts in capturing his prey, when the soil is light, and when showers of rain have enticed the worms to the surface. This is accomplished by boring shallow trenches immediately under the surface, surprising and catching these unfortunate annelids at the most unsuspected moments. Every one must have observed these mole-runs in fields which have been only recently sown with grain. The mole is a hard drinker, and his appetite in this respect is in perfect harmony with his flesh-eating propensities. He is also a first-rate swimmer, and, as we have seen, his form is singularly adapted for easy propulsion through any firmly-resisting medium. He will not only take the water when inundations or a desire to change his hunting grounds compel him to migrate, but Mr. Bell avers that he sometimes takes a swim "merely for the purpose of enjoying the luxury of a bath." The male mole is exceeding fierce during the love season, and readily resents any individual of the same sex who should unhappily be paying his addresses to the same female as himself. Formidable pitched battles are fought, and much blood shed on such occasions, while the unfortunate object of affection is also somewhat roughly handled. The nest is generally situated at a considerable distance from the habitation; it is well constructed and compact, but its place of location is not always to be found indicated by a hillock. When the latter is present it exceeds in size that of an ordinary molehill. The nest is built "by enlarging and excavating the point where three or four passages meet and intersect each other." In one instance no less than two hundred and four wheatblades were counted by Geoffroy St Hilaire, and Le Court. From this circumstance alone, therefore, we can well comprehend the weight of those accusations which have from time immemorial been levelled against the mole. Some distinguished naturalists, and most prominently among them Mr. Bell, have endeavoured to advocate its cause, and to contend that after all the mole is not such a thievish villain as some have supposed. Without entering at any great length into this instructive controversy, we are inclined, all things considered, to take the view and state the case, as Professor Owen has succinctly put it, in the following words—"The farmer views the operations of the mole as destructive to his crops, by exposing and destroying their roots, or by overthrowing the plants in the construction of the molehills; his burrows, moreover, become the haunts

of the fieldmouse and other noxious animals. The mole is also accused of carrying off quantities of young corn to form its nest; hence every means are devised to capture and destroy it, and men gain a livelihood exclusively by this occupation. Some naturalists, however, plead that the injury which it perpetrates is slight, and that it is more than counterbalanced by the benefit which it produces by turning up and lightening the soil, and especially by its immense destruction of earthworms and many other noxious animals, which inhabit the superficial layer of the ground, and occasion great injury to the roots of grass, corn, and many other plants. The soundest practical conclusion lies probably in the mean of these opinions, and the enlightened agriculturist, while he takes prompt measures to prevent the undue increase of the mole, would do well to reflect on the disadvantages which might follow its total extermination." The common mole is found in nearly all parts of Europe, but in Greece it is said to be scarce, while in the more northern counties of Scotland, and in the contiguous isles of Orkney and Shetland, it is stated to be altogether unknown.

THE THICK-TAILED STAR-NOSE (*Condylura macroura*).—The individuals of which this genus is composed, are closely allied to the true moles, not only in their general form, but also in their habit of life. Their dental arrangement is peculiar. Of the ten cutting teeth, six occupy the upper and four the lower jaw. The two central teeth of the superior row are remarkably broad, also somewhat triangular and curved anteriorly. The lower series slope forwards in an almost horizontal direction. There are no true canines, as usual; but the deficiency is sufficiently compensated by the presence of thirty grinding teeth, seven on either side of the upper, and eight on those of the lower. The anterior three of the superior series, or upper false molars as they are called, are small, conical, and more or less widely separated from each other, while the inferior false molars, five in number on either side, are irregularly serrated and trenchant. Several species have been described; but



Snout of the Star-nose, or *Condylura*.

their differentiating characters do not appear to be very strongly marked. In all of them the muzzle is prolonged into a narrow proboscis, the naked extremity of which is furnished with a number of moveable cartilaginous, styloform processes or caruncles, radiately disposed like the spokes of a wheel (fig. 17). All have

very minute eyes. The ears are destitute of conspicuous auricles; the feet are pentadactylous or five-toed; the tail is of moderate length, varying, however, in this respect with different species, and only loosely clothed with hair. In the Thick-tailed Star-nose "the head is remarkably large; the body is stout and short, and becomes narrower towards the tail, and the hind legs are consequently nearer to each other than the fore ones. The nose is rather thick, and projects beyond the mouth. It is naked towards its end, is marked with a furrow above, and terminates in a flat surface, which is surrounded by seventeen cartilaginous processes, with two more anterior ones situated above the nostrils, and a pair of forked ones immediately below the nostrils. The surfaces of these processes are minutely granulated. Some white whiskers spring from the side of the nose, and reach about half the length of the head. There are others not so long on the upper and under lips. The fur on the body is very soft and fine, and has considerable lustre. It is longer than the fur of the other two known species. Its colour on the dorsal aspect is dark amber brown, approaching to blackish-brown. On the belly it is pale liver brown. When the fur is blown aside it exhibits a shining blackish-grey colour towards its roots. It is longer behind the head and on the neck, than on the belly. The tail is narrow at its origin; but it suddenly swells to an inch and a half in circumference. It then tapers gradually until it ends in a fine point, formed by a pencil of hairs about half an inch long. It is round, or very slightly compressed, and is covered with scales about as large as those on the feet, and with short, tapering, acute hairs which do not conceal the scales. The hairs covering the upper surface of the tail are nearly black; those beneath are of a browner hue. The extremities are shaped almost precisely like those of *C. longicaudata*, only the palms and toes of the fore feet project beyond the body. The palms are nearly circular, and are protected by a granulated skin, like shagreen. The sides of the feet are furnished with long white hairs which curve in over the palms. The five toes are very short, equal to each other in length, and, together with the back of the hands, are covered with hexagonal scales. The fore claws are white, nearly straight, broadly linear and acute, convex above and flat beneath. The palms turn obliquely outwards, which causes the fourth claw to project rather farthest; but the third one measures as much, the second is shorter, and the first and fifth are equal to each other, and a little shorter than the rest. The hind feet are also turned obliquely outwards, and are scaly, with a few interposed hairs above, and granulated underneath. The sides are narrow, and present a conspicuous callous tubercle posterior to the origin of the inner toe. The hind legs are very short, and are clothed with soft brown hairs, a tuft of which curves over the heel. There are no hairs on the sides of the hind feet, like those

which form a margin to the fore ones. The hind toes are longer than the fore ones, and are armed with more slender claws, which are white, awl-shaped, curved, and acute. They have a narrow groove towards

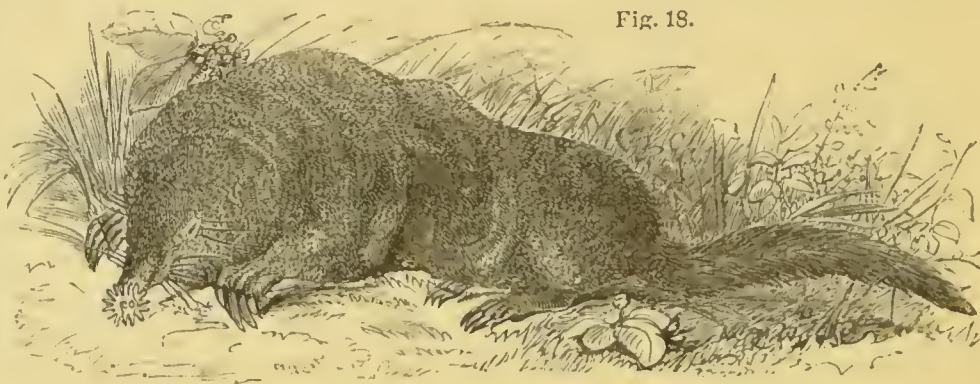


Fig. 18.

The Common Star-nose (*Condylura cristata*).

their point underneath." The length of the body, not including the tail, is four inches and a quarter. This minute and accurate account is taken from Sir John Richardson's description of a specimen captured on the banks of the river Columbia, and all the examples hitherto received have been brought from North American districts. Fig. 18. represents a very closely-allied form. The generic name *Condylura* was originally given to these moles by the naturalist Illiger, who was misled by a figure which had been executed from a dried specimen, and consequently showed a knotted appearance of the tail. This irregularity of the tail unfortunately suggested to him the generic title now generally adopted; but the term *Rhinaster* proposed by Wagler, would have been, scientifically speaking, more correct.

THE LUSTROUS CAPE MOLE (*Chrysochloris capensis*).—The members of this small genus are also pretty closely allied to the true moles. They differ, however, in some respects, and among the most important distinctions are those which concern the skeleton and teeth. Following the authority of De Blainville, there appear to be twelve cutting teeth, six above and six below, the two central teeth of the lower jaw being very minute. Of the grinding series there are probably twenty-eight, six of which come under the category of false grinders or premolars, two of them being superior and four inferior. The true molars have the form of triangular prisms with transverse crowns, which in the lower set are divided by corresponding grooves. All the species have the eyes covered by the integument, while there is no appearance of an external ear. The muzzle is short and broad, terminating in a slightly pointed and projecting nose. The fore foot or hand is apparently tetradactylous; but there are in reality five toes or fingers, the phalanges of the third and fourth fingers having coalesced to form a single gigantic digit. The latter is armed with a prodigiously strong claw, which is broad and arcuated, forming a powerful weapon for digging and burrowing in the earth; the fifth digit is particularly small and rudimentary. The hind feet are obviously pentadactylous, the several toes presenting the ordinary dimensions. The body is short and stout, and unprovided with a tail. The skeleton offers numerous points of

interest. The skull exhibits a more conical form than obtains in the true moles. There are no less than nineteen pairs of ribs, whilst in one species as many as twenty have been counted. The sternum is provided with small concave lateral appendages; the first rib is unusually broad; the clavicles and the scapulæ are long and thin. The humerus is comparatively longer than that of the common mole, and at the lower part it is not only articulated to the radius and ulna, but also to a third bone, specially developed to strengthen the arm during the action of burrowing. This strange supplementary osseous appendage is supposed to represent one of the carpal elements of the wrist; be that as it may, the circumstance of these creatures' possessing a fore-arm consisting of three long bones, indicates an anatomical and morphological change altogether without precedent in this region of the mammiferous skeleton. The Lustrous Cape Mole or Chrysochlore—Fig. 19—is not quite so long as the

or, in other words, are non-fossorial. In some of the aberrant types we still recognize the peculiar talpine features, and so much so is this the case in the genus we shall here first elucidate, that it becomes almost a matter of indifference whether we class them as moles or shrews, or, on the other hand, altogether recognize them as a separate osculant group.

THE SHREW MOLE (*Scalops aquaticus*).—This species, in common with others of the genus *Scalops*, presents a stout, thickset, cylindrical body, the limbs being remarkably short. The pentadactylous feet and hands very closely resemble those of the common mole, especially the latter, which are also situated close to the auditory opening. The head terminates anteriorly in a movable snout, which is naked at the tip. The teeth are probably forty-four in number, but a considerable difference of opinion exists on this point. According to Professor Owen there are twelve incisors, four canines, sixteen false grinders, and twelve true

molars; half of these severally belonging to either jaw. The eyes are extremely small and concealed by the fur. The colour of the hair is, generally speaking, of a greyish-black, approaching to brown in some regions, especially on the forehead, where it assumes a chestnut tinge. The length of the body is rather more than seven and a half inches, not including the tail, which is short, annulated, and very thinly clothed with hair. The shrew-moles are inhabitants of the low grounds and marshy districts bordering on the river Columbia, and the adjacent coasts of the Pacific. Sir John Richardson speaking of

Fig. 19.



The Lustrous Cape Mole or Chrysochlore.

common European mole. The fur is of a brownish colour, capable of reflecting iridescent hues of green and purple, which change to a copper or bronze tint; and thus we have brought before us, in the language of Cuvier, "the only known quadruped which exhibits any appearance of that splendid metallic lustre which adorns so many birds, fishes, and insects." The species under consideration is found at the Cape of Good Hope, but other kinds are obtained from the same locality, as well as from the neighbourhood of Mozambique.

FAMILY II.—SORICIDÆ.

From a consideration of the moles we pass by a very natural transition to the Soricidæ, which are more commonly known as the shrews, or shrew-mice. They have a very general resemblance to ordinary mice; but while the latter have their front teeth formed for gnawing vegetable structures, the former are entirely insect-feeders, as in the case of the moles. The typical Soricidæ exhibit conspicuous eyes and ears, and the feet are not formed for burrowing in the soil,

their habits says, that they resemble our common European mole, "in leading a subterranean life, forming galleries, throwing up little mounds of earth, and in feeding principally on earthworms and grubs. Dr. Godman has given a detailed and interesting account of their manners, particularly of one which was domesticated by Mr. Titian Peale. He mentions that they are most active, early in the morning, at mid-day, and in the evening, and that they are well known in the country to have the remarkable custom of coming daily to the surface exactly at noon. They may be taken alive by thrusting a spade beneath them and throwing them on the surface, but can scarcely be caught at any other period of the day. They burrow in a variety of soils, and in wet seasons are observed to retreat to the higher grounds. The captive one in possession of Mr. Peale ate considerable quantities of fresh meat, either cooked or raw, drank freely, and was remarkably lively and playful, following the hand of its feeder by the scent, burrowing for a short distance in the loose earth, and, after making a small circle, returning for more food. When engaged in eating he employed his flexible snout in a singular

manner to thrust the food into his mouth, doubling it so as to force it directly backwards."

THE MUSK RAT (*Mygale moschata*).—This rather ugly-looking animal has few characters in common with the moles, unless we make exception in favour of the form of the body, the shortness of the limbs, and some other non-essential features. It possesses a long snout or proboscis which is very mobile, and usually more or less curved downwards. The eyes, though small, are comparatively distinct, while the short ears scarcely project beyond the fur. The arrangement of the teeth is somewhat peculiar, there being six incisors, four of which, that is, two above and two below, are very largely developed, and look like canines; of these, however, there are none. There are no less than thirty-eight grinders, twenty in the upper and eighteen in the lower jaw. The feet are pentadactylous, the digits being severally connected together by a membrane to facilitate locomotion in the water. The tail is about one-fourth shorter than the body, and compressed from side to side throughout, especially at the tip; it is thinly haired, but very scaly, being also provided with numerous glandular follicles, arranged in double series along the under surface. These organs secrete a fatty matter or kind of pomatum giving out a peculiar musky odour. The fur presents a dusky-brown colour. The musk rat is very common in the rivers and lakes of southern Russia, and more particularly on the banks of the Volga. According to Mr. Ogilby, "it does not appear to have been seen on dry land, and, indeed, it is broadly asserted that it never goes there, but wanders from lake to lake in fortuitous floods only. It is often seen swimming or walking under the water, and coming for air to the surface, where, in clear weather, it is apt to sport. Stagnant waters, shut in by high banks, are its favourite localities, and in such places it makes burrows some twenty feet in length. Its principal food is alleged to consist of fish, leeches, and the larvæ of water insects; but fragments of roots have been found in its stomach. Its pace is slow; but it does not seem to be torpid in winter, at which season it is often taken in nets. The holes which it makes in cliffs and banks have the entrance far beneath the lowest level of the water, and the animal works upwards, never, however, nearing the surface more than sufficiently high to secure itself from the farthest rise of the river. Fish, as we have seen, form part of its food; but the quadruped in its turn falls a victim to the pikes and *siluri*, whose flesh becomes so impregnated with the flavour of musk in consequence, as not to be eatable." Formerly a very considerable trade was carried on at Orenberg for the sale of these animals' skins and tails, which, from their extraordinary abundance, only realized a sale at the rate of twenty copecs per hundred—a sum equivalent to eightpence-three farthings, of English money.

THE ELEPHANT MOUSE (*Macroscelides typicus*).—This is perhaps the best known of the seven or eight species which constitute the members of the genus. Its name almost suggests a combination of the sublime and the ridiculous, for the only feature by which this tiny creature in any measure resembles the huge pachyderm, lies in the circumstance of its possessing

an elongated proboscis-like snout, at the extremity of which there are two oblique perforations representing the nostrils. The base of the snout supports numerous long stiff hairs or whiskers. In regard to the teeth, there are ten incisors, six above and four below, no true canines, and thirty-two molars, that is, fourteen in the upper and eighteen in the lower jaw. The ears are large and thinly haired. The feet are pentadactylous and plantigrade, the digits corresponding to the thumbs in the fore-feet, and the great toes in the hind-feet being very short; the claws are thin and strongly incurved. The fur has a tawny-brown colour, gradually becoming whitish on the limbs. The length of the body is rather less than five inches, the tail being likewise three and a quarter inches long, a little swollen immediately beyond the root, and provided, in the males at least, with minute glandular follicles. This and some other species of so-called elephant mice live in south Africa. Their habits are diurnal, and they are frequently seen hunting for their prey amongst the roots of brushwood and bushes. On being discovered, however, their timidity soon shows itself, and they scamper off in hot haste; retreating either into their natural burrows, or beneath stones and similar places of security.

THE SOLENODON (*Solenodon paradoxus*).—The distinguished naturalist Brandt has employed this title to designate a remarkable animal forming a sort of gigantic shrew. It is an inhabitant of the island of St. Domingo, is covered with coarse fur, and possesses very long whiskers. Each jaw is armed with six incisor teeth, the two central ones of the upper series being very large and triangular, while the pair next outside the central ones of the lower jaw are elongated, conical, and hollowed out at the inner surface by a deep groove. These two pairs assume the aspect of very powerful canines, but the latter have in reality no true representatives. The molars are twenty-eight in number, that is, seven on either side of each jaw. This singular creature is larger than our common brown rat, being upwards of twenty inches in length, including the naked or scaly tail, which measures nine inches. The eyes are small, the nose slightly probosciform, the ears also being only moderately developed. The sides of the head and neck, as well as the abdomen and feet, exhibit a faint yellow-brown colour, with an occasional mixture of a greyish tint.

THE COMMON SHREW (*Sorex araneus*).—Plate 6, fig. 21. The genus *Sorex* comprehends an extremely numerous series of individuals, and it has therefore been variously subdivided by different naturalists. Without, however, expressing any opinion as to the propriety of their arrangements, our object is to impart a definite and accurate knowledge of the more important forms, under whatever names they may be clearly recognized. Even the species under consideration has caused much controversy, but it is now very generally understood that the common shrew-mouse of the British isles is correctly indicated by the above combined generic and specific title. Among the characteristics which distinguish this form we may especially refer to the teeth, of which there are probably ten incisors, though on this point there seems to be

considerable difference of opinion. They are "much produced; the upper ones curved and notched at the base, the lower ones almost horizontal." There are in all twenty-four molars or grinding teeth, but no true canines. The length of the body, not including the tail, is about two and a half inches. The fur exhibits a reddish tint on the back, which passes from the ordinary mouse-colour to a light-grey on the under surface of the belly. The snout is conical and pointed; the eyes and ears are small,—the latter being scarcely visible—and furnished with two lobes internally. With regard to its habits Mr. Bell observes, that "the common shrew frequents dry situations, feeding upon insects and worms, in the pursuit of which its attenuated snout enables it to grub amongst the closest herbage, or under the surface of the soil; for which habits it is also adapted by its soft, short, velvety coat, and its extensible form. Like the mole and other insectivorous tribes, it is very impatient of hunger during summer; like that animal too it is excessively pugnacious, so that it is rare to see two of them together excepting in the act of fighting. If two shrews be confined in a box together, a very short time elapses before the weaker is killed and partly devoured. They not only destroy each other, but there is reason to believe that many of them are victims to the voracity of the mole." A friend also informed him "that, in a field which had always before been abundantly inhabited by shrews, scarcely one had been seen during the then present season; but that a colony of moles had occupied the district, to whose voracity he, with much probability, attributed the disappearance of the shrews." Touching the early history of this creature many curious superstitions were formerly held in this country respecting them; but though, as we have recently taken occasion to show, these follies do still exist in regard to certain animals, we are inclined to believe that, so far at least as the shrews are concerned, they have almost entirely passed away. The childish notion that lameness of the foot or some grave disease could result from the mere accidental passage of a shrew over that part of the body of another animal was really credited, and, absurdly enough, induced our intellectual peasantry to prepare a ridiculous charm, which they swore to be an unfailing antidote against these imaginary injuries. This preparation was called shrew-ash, and a twig or fragment of it constituted the remedy. The *modus operandi* in the manufacture of this ash is thus described by Mr. Gilbert White:—"At the south corner of the plestor or area, near the church, there stood about twenty years ago a very old, grotesque, hollow pollard-ash which, for years had been looked upon with no small veneration as a shrew-ash. Now a shrew-ash is an ash whose twigs or branches, when applied to the limbs of cattle, will immediately relieve the pains which a beast suffers from the running of a shrew-mouse over the part affected; for it is supposed that the shrew-mouse is of so baneful and deleterious a nature that, whenever it creeps over a beast, be it horse, cow, or sheep, the suffering animal is afflicted with cruel anguish, and threatened with the loss of the use of the limb. Against this accident, to which they were continually

liable, our provident forefathers always kept a shrew-ash at hand, which, when once medicated, would maintain its virtue for ever. A shrew-ash was made thus:—Into the body of the tree a deep hole was bored with an auger, and a poor devoted shrew-mouse was thrust in alive, and plugged in, no doubt with several quaint incantations long since forgotten." Some other methods of cure were likewise had recourse to, but of these it is unnecessary to speak further. The shrew-mouse propagates very rapidly, the female bringing forth six or seven young ones at a birth. The nest is rudely constructed of grass and other vegetable materials, and is placed in superficial holes in the earth, especially amongst hedgebanks, the debris and snug recesses of which afford abundant security. An excess of these animals is wisely prevented by the agency of owls, moles, and weasels, and also, it would appear from the statements of several writers, by a special mortality which cuts them off by hundreds during the autumnal months. The immediate cause of this phenomenon yet remains to be explained.

THE WATER SHREW (*Sorex fodiens*).—This form is darker than the common shrew upon the back, and also, on the other hand, of a lighter colour beneath the belly, being in point of fact, quite white. The feet and tail are provided with conspicuous, but thinly set hairs. The ears and eyes are very small, the auricles being furnished with three internal lobes. It is also a somewhat stouter species, while, at the same time, it measures three and a quarter inches in length. The fur is very close, smooth, and downy—a circumstance which, together with an increased breadth of the feet, favours the development of its swimming propensities. Perhaps the best account of the habits of this pretty little animal, is that long ago recorded by Mr. Dovaston in the second volume of *Loudon's Magazine of Natural History*. Speaking of the behaviour of one of these shrews, he says—"It swam with great agility and freedom, repeatedly gliding from the bank under water, and disappearing below the mass of leaves at the bottom, doubtless in search of its insect food. It very shortly returned and entered the bank, occasionally putting its long sharp nose out of the water, and paddling close to the edge. This it repeated at frequent intervals from place to place, seldom going more than two yards from the side, and always returning in about half a minute. Sometimes it would run a little on the surface, and sometimes timidly and hastily come ashore, but with the greatest caution, and instantly plunge in again." This species has a pretty wide distribution throughout the British isles, being found in Devonshire, and also as far north as Scotland. The female brings forth six or seven young at a birth.

THE OARED SHREW (*Sorex remifer*).—This is a comparatively large species, and, like the two preceding, indigenous to the islands of Great Britain. Its body is rather more than three inches long, the tail also being two-thirds of the entire length of the animal. The last-named organ has a quadrilateral shape. It is flattened towards the tip, being also provided with stoutish hairs along the under surface. The fur is of a rich black colour, except at the lower part of the belly, where, in some specimens at least, it is greyish-

black, and also of a yellow tinge towards the region of the throat. The snout is compressed, the eyes and ears are small, the latter being bordered by a fringe of whitish-coloured hairs. The teeth exhibit a rusty or chestnut hue at their tips—a peculiarity, however, not confined to any particular species. Like the water shrew, its habits are essentially aquatic.

THE INDIAN SHREW (*Sorex indicus*).—Though in general appearance this species closely resembles the common shrew, the size at once distinguishes it, being in this respect equal to our common brown rat. In virtue of a very strong musky odour, it imparts a peculiarly nauseous smell to every thing with which it may happen to come in contact. Some of the stories told of its powers of communicating odoriferous properties to particular objects, appear to be rather exaggerated. For example, we are informed that wine in a properly-closed bottle will become impregnated with a musky flavour, merely by the circumstance of this animal's passing over the exterior surface of the glass! Surely this savours a little of the imaginative. At all events, the little beast enjoys an unenviable credit on this score. It is better known by the name of the Indian musk rat.

THE AMERICAN MARSH SHREW (*Sorex palustris*).—This species is principally marked by the possession of an unusually long tail, combined with very short hairy ears which lie entirely concealed beneath the fur. The hairy covering exhibits a hoary black colour, except on the belly, where it is lighter and of an ash-grey tint, the texture throughout being dense, soft, and lustrous. The teeth are thirty in number; that is, four incisors and twenty-six molars. Sir John Richardson was the first to describe this shrew, and he obtained several specimens in British America during his explorations with the expedition under Sir John Franklin. With regard to its habits, he says that it "lives in the summer on similar food with the water shrew, but," he adds, "I am at a loss to imagine how it procures a subsistence during the six months of the year in which the countries it inhabits are covered with snow. It frequents the borders of lakes, and Hearne tells us that it often takes up its abode in beaver houses." The length of the body, not including the tail, is precisely three and a half inches.

FORSTER'S SHREW (*Sorex Forsteri*).—The shrew thus named appears to have been first noticed by Forster, and described by him in the sixty-second volume of the Philosophical Transactions. It resembles the oared shrew in respect of the quadrangular form of the tail, and in some other minor particulars. The length of the body is about two and a quarter inches. It is armed with thirty-two teeth, four being incisors and the remainder true and false molars. The snout is much attenuated; the whiskers are conspicuous, and the ears completely enveloped by the fur. The author of the "Fauna Boreali Americani," speaks of it as follows:—"This little animal is common throughout the whole of the fur countries to the sixty-seventh degree of latitude, and its minute foot-prints are seen everywhere in the winter when the snow is sufficiently fine to retain the impression. I have often traced its pathway to a stalk of grass by which it appears to

descend from the surface of the snow; but a search for its habitation by removing the snow was invariably fruitless. I was unable to procure a recent specimen." And further on he says—"It is the smallest quadruped the Indians are acquainted with, and they preserve skins of it in their conjuring bags. The power of generating heat must be very great in this diminutive creature, to preserve its tender limbs from freezing when the temperature sinks forty or fifty degrees below zero."

SAVI'S SHREW (*Sorex etruscus*).—To the general observer of nature, the distinctions established between the numerous species of shrew may not at first sight appear very satisfactory, and it is partly on this account that we find it necessary to confine our attention to the more striking or better known forms. There is a little North American form, emphatically called the small shrew-mouse—the *Sorex parvus* of Say and Richardson—which is only two inches and three-quarters in length; but this specific title might perhaps with greater propriety be applied to the species under consideration; for Savi's shrew is not only believed to be the smallest in existence, but it is probably the tiniest of all living quadrupeds, excepting, of course, those which have not attained their adult or fully developed state. The body of Say's small shrew measures two inches and three-quarters, without reckoning the tail; whereas the little *Sorex etruscus* scarcely exceeds two inches and a half, two entire fifths of which measurement belong to the caudal appendage. It is an inhabitant of Italy and the northern coasts of Africa. Notwithstanding what we have here advanced, it will doubtless occur to our readers that some of the bats scarcely exceed this animal in length; although, if placed side by side with the pipistrelle, this bat would appear in all likelihood comparatively bulky.

THE BULAU (*Gymnura Rafflesii*).—The members of this and the two following genera offer such peculiarities as scarcely to entitle us to classify them with the Soricidæ, properly so called; and on the one hand, they neither sufficiently agree in their respective characters, so as to enable our associating them together under a separate family title, nor, on the other, are they clearly referable to the *Tupaia*dæ; yet, as they exhibit characters of a very mixed kind, we cannot at present, perhaps, do better than briefly record them in the order here adopted. The head of the bulau is much elongated and compressed from side to side, the muzzle being probosciform, obtuse at the tip, and continued forward a considerable distance beyond the lower jaw. The eyes are rather small, and the ears rounded, conspicuous, and naked. The body is stoutish posteriorly, and terminates in a long, smooth, scaly tail which supports a few thinly scattered hairs. The mass of the fur is soft; but from beneath this downy covering there projects a multitude of long harsh, bristle-like hairs, which are particularly numerous along the back. The limbs are well developed, and terminate in plantigrade pentadactylous feet, having the three middle toes longer than the other digits. The jaws are armed with forty-four teeth, which Professor Owen has divided into twelve incisives, four canines, sixteen false, and twelve true molars. They

are equally distributed above and below. It is also worthy of remark, that the skeleton displays fifteen pairs of ribs and five lumbar vertebræ. In external form this animal approaches the American marsupials; but little or nothing is known of its habits.

THE RHYNCHOCYON (*Rhynchocyon cirnei*).—The eminent naturalist Peters has given this name to an extremely rare and very curious animal, discovered by him during his travels in the Mozambique. In certain particulars it resembles the bulau; but its snout is very much more prolonged, forming a conspicuous proboscis. The ears are moderately developed; but the eyes are comparatively large. The jaws are furnished with thirty-six teeth, somewhat irregularly disposed, there being only two incisors above while there are six below; and of the twenty-eight molars, the anterior pair in the upper series are sufficiently elongated to be at first sight mistaken for canines. The feet are plantigrade, tetradactylous, and armed with strong claws, the outer toe of the fore-feet being widely separated from the others. As in the preceding species, the hind feet are longer than the front ones. The tail is considerably developed, annulated, and sparingly clothed with hair.

THE HYLOMYS (*Hylomys suillus*).—M. Salomon Müller employs this name to designate a small and rare animal inhabiting the islands of Sumatra and Java, and living at a height of from twelve hundred to two thousand feet above the level of the sea. In the form of the skull and other cranial peculiarities, it appears to approach the members of the succeeding family; but the back of the orbit is not closed in by a bony ring, such as is found in that remarkable group. The teeth are forty-four in number; that is, twelve incisors, and thirty-two molars. The snout is prolonged forwards into a movable proboscis, which is directed a little downwards at the tip, where the nostrils are laterally disposed. The eyes are not large; but the ears are conspicuous, and thinly provided with hair. As in the bulau, the feet are pentadactylous, the three central digits being paramount, and the hind feet longer than the fore ones, the claws being sharp and strongly curved. The tail is particularly short, and but thinly clothed with hair. Very little is known respecting its habits. The teeth, however, indicate its insectivorous propensities.

FAMILY III.—TUPAIADÆ.

The Tupaias are here collected into a separate group, chiefly on account of several well-marked anatomical peculiarities. The most important of these consists in the presence of an osseous ring completing the posterior part of the orbit, and entirely circumscribing that cavity. In all other species of the order Insectivora, a communication exists between the orbits and the spaces occupied by the temporal muscles which act upon the lower jaw. In this, and in some other features, we observe a structural and morphological approach towards the insectivorous monkeys. Throughout the family we have an elongated head, which is very much narrowed towards the pointed muzzle, and at the extremity of this snout the semilunar nostrils

are placed sideways. The ears and eyes are largely developed, the latter projecting sufficiently to enable the animals to see backwards almost in a straight line. The body is long and narrow, but provided with tolerably strong limbs, terminating in plantigrade, five-toed feet, the digits being armed with sharply-curved claws. All the species at present known are inhabitants of the Sunda islands, while some few have been found in Pegu and on the shores of the Indian peninsula. Their habits are diurnal and active, and from this circumstance they have always been associated with the squirrels by the native Malays.

THE JAVANESE BANGSRING (*Tupaia javanica*).—This species was first familiarly made known to naturalists by Dr. Horsfield, who during his travels in Java, in the year 1806, discovered numerous examples in the thickly-wooded forests of the province of Blambangan. The body being slender and compact is eminently fitted for active pursuits. The limbs are gracefully formed, imparting to the creature an easy and attractive appearance. The five-toed feet terminate in compressed and strongly-curved claws, which are firmly implanted into the somewhat swollen tips of the several digits. The tail forms a very conspicuous organ. It is fully as long as the body, having an almost uniform thickness from root to tip, and is clothed with regularly arranged hairs spreading out like those of the squirrel, but in a more limited degree. The fur consists, for the most part, of fine straight hairs closely applied to the skin; the back, neck, sides, and limbs being provided with a few longer, stouter, and darker-coloured hairs. The colour is of a greyish-brown, varying considerably at different spots, being lighter underneath the throat, chest, and belly. The head is narrowed anteriorly, and the eyes are particularly prominent. The bangsring and its allies appear to be very easily tamed; for a specimen of this genus which came under the notice of Sir Stamford Raffles, behaved itself like a pet spaniel, freely partaking of fruits and milk at the breakfast and dinner table, and scampering through the house with evident satisfaction.

FAMILY IV.—ERINACEADÆ.

The hedgehogs are readily recognized by their peculiar spinous integument and the remarkable power possessed by the more typical forms of rolling themselves up into a ball. This function is accomplished by the agency of a special development of the subcutaneous muscular bands, which are more or less developed in all the mammalia, forming in scientific nomenclature the muscular mass termed the *panniculus carnosus*. It is of such strength in these creatures, that in their doubled-up state they are capable of resisting almost any force which their enemies employ to unroll them, while the points of the setæ or spinous bristles inflict severe wounds upon the aggressors. In other respects the hedgehogs exhibit a general conformity to the insectivorous type. The muzzle is pointed, and prolonged beyond the lower jaw. The eyes and ears are tolerably conspicuous; the latter, however, are rather short. The feet are pentadac-

tylous and armed with powerful claws; but the anterior pair are not specially modified for the purposes of burrowing like the moles. The tail is either very short or altogether absent.

THE TENREC (*Centenes setosus*).—This animal differs from the ordinary hedgehogs both in respect of certain structural modifications, and also in the circumstance of its not being able to fold itself up into a ball; at least, its powers in this particular are extremely limited. The skin along the back is armed with a mixture of slender spines and bristles, and the body terminates abruptly behind without any trace of a tail. Some difference of opinion exists in regard to its dentition, owing, perhaps, to the fact that many of the specimens examined were quite young. In the adult state there are probably twelve incisors, four canines, twelve false and also twelve true molars—that is, forty teeth in all, equally divided between the two jaws, the canines being large and of a conical shape. The muzzle is much attenuated and probosciform. The tenrec is a native of the island of Madagascar; it is possessed of nocturnal habits, and passes three months of the year in a state of hibernation. According to the statements of Brugiere, the torpidity occurs during the period of greatest heat.

THE SOKINAH (*Echinops Telfairi*).—Under this title Mr. W. C. L. Martin has described, in the second volume of the Transactions of the Zoological Society of London, a kind of hedgehog which, like the foregoing, is an inhabitant of Madagascar. This animal is chiefly distinguished by the peculiarities of its dentition. It possesses ten incisors, four only of these occupying the upper jaw, the anterior pair being strongly developed and placed somewhat in front of the others; there appear to be four canines and but twenty-four molars—that is, five on each side of the upper, and seven on either side of the lower jaw; the crowns of the upper molar series are longitudinally grooved. Notwithstanding this dental arrangement, the sokinah cannot be said to differ very materially from the hedgehogs properly so called.

THE COMMON HEDGEHOG (*Erinaceus europæus*) Plate 6, fig. 20.—Most persons are familiar with this bristly urchin. All who have dwelt amid rural scenes or wandered along grassy hedgerows, have surely come in contact with our thorny friend. Yes! we shall deign to consider him a friendly individual, notwithstanding that he turns his back upon us and displays a *cheveux de frise* of little bayonets pointing in every conceivable direction. "Stay!" remarks one of my readers, "he is an enemy! To my certain knowledge, he has the credit of pilfering milk direct from the cow; he is a notorious stealer of apples and pears; he is an unsparing egg-poacher; and, moreover—which to my mind is the most cogent argument against him—he is a nasty, dirty little beast. for, as old Pliny observes, he sprinkles himself all over with urine, for the express purpose of disgusting alike his tormentors and admirers, thereby necessitating a respectful distance! What do you say to that, Sir; will you still call him a friend?" Patience! impetuous reader, and you shall have my answer to your hypercritical censures upon this comparatively harmless animal. In the first place, with

regard to the asseverations of the ancient historian of nature, they may safely be regarded as the gratuitous offspring of a fertile imagination, having, in point of fact, no other foundation than such as I have myself witnessed—namely, an involuntary expulsion of the fluid secretion on the part of the animal itself, when suddenly and violently alarmed. Secondly, in regard to the milking propensities, no one has ever yet witnessed the animal's indulgence of this refreshing experiment. Thirdly, with respect to his alleged carpological thefts, the body is but ill-adapted for climbing fruit-trees, though I admit, in a time of famine, he will not refuse apples and pears which have accidentally fallen to the ground; but the story to which you allude bears on its face the very stamp of absurdity, seeing it would have us believe that he not only ascends the tree, but, in the doubled-up state, voluntarily throws himself from the branches with sufficient precision to alight on the fallen fruits; these, in consequence, adhere to his skin, and, having unrolled himself, he hurries off with the desired booty upon his back! Fourthly, while I grant there is strong evidence of his being a poacher, you must bear in mind, before hastily pronouncing him to be a worthless character, that he only resorts to fowls' and pheasants' eggs when the supply of mice, snails, slugs, worms, and various insects, fail to satisfy his legitimate demands. On the whole, therefore, will you not be disposed to regard the hedgehog as an erring creature which does more good than harm? Let me direct your attention to its organization. On closely contemplating the structure of the hedgehog, we cannot fail to be struck with the marvellous adaptations provided for its comfort and security. "Deprived," says Mr. Bell, in his admirable history of British quadrupeds, "of all means of attacking its enemies, of defending itself by force, or of seeking safety in flight, this harmless animal is yet endowed with a safeguard more secure and effectual than the teeth and claws of the wild cat or the fleetness of the hare. Its close covering of sharp spines, which are hard without brittleness, sufficiently elastic to bear great violence without breaking, and fixed with astonishing firmness in the tough leathery skin, forms not only a solid shield to protect it from the effects of blows or falls, but a shirt of prickly mail sufficiently sharp and annoying to deter all but a few thoroughbred dogs, or a half-starved fox, from venturing to attack it. Immediately it is touched, or when it sees danger approaching, it rolls itself up into a compact round ball, by the contraction of the powerful muscles which cover the body immediately under the skin, and presents this impenetrable panoply, beset by innumerable spines standing out in every direction; and the more it is irritated or alarmed, the more firmly it contracts, and the more strongly and stiffly the spines are set. The strength and elasticity of this covering is such, that I have repeatedly seen a domesticated hedgehog in my own possession run towards the precipitous wall of an area, and, without hesitation, without a moment's pause of preparation, throw itself off, and, contracting at the same instant into a ball, in which condition it reached the ground from a height of twelve or fourteen feet, after a few moments it

would unfold itself and run off unhurt." This last-mentioned phenomenon appears to give some clue to the ridiculous story of the hedgehog's voluntary falls from the branches of fruit-trees; at all events, the circumstance illustrates the well-known remark, that all widely-spread notions, however false and egregious, have their origin in some misinterpreted fact or other element of truth. Hedgehogs are readily tamed, and are, we believe, still kept by a few persons to eat up cockroaches and other noxious insects which infest our houses. Some aver that the flesh is good eating, but others dispute its merits in this respect; gipsies, at any rate, will cook and eat them. Without entering into a lengthened description, we may remark that a full-grown example measures about nine and a half inches,

not including the rudimentary tail, which is only three-quarters of an inch long. The jaws are armed with thirty-six teeth—that is, eight incisors, six above and two below, and twenty-eight molars. The ears are short and oval, the eyes being bright and distinct. At the lower part of the body the spines degenerate, as it were, into mere bristles and stout hairs. The animal's habits are essentially nocturnal, and during the winter it remains in a torpid state, hybernating in the hollows of decayed trees and similar secure retreats. The nest is carefully constructed and rain-proof. In the early part of the summer the female produces from two to four young ones at a birth, their skin being covered with soft white elastic bristles, which in a very few days assume the ordinary hard spinous character.

ORDER V.—CARNIVORA.

IN the arrangement of Cuvier, this eminently carnivorous group of animals constitutes the third family of those unguiculated mammals, which he associated together under the common title of Carnassiers. It is in these Carnivora, properly so called, that we observe the highest development of physical force combined with a purely zoophagous appetite. If, for example, we examine the skeleton of a lion, we shall find its mechanism specially adapted for the purposes of active pursuit, and for the employment of overbearing strength (Plate 33, fig. 105). The skull is short, broad, and massive, the hind part supporting at the vertex a longitudinal ridge or crest. The object of this median elevation is to afford attachment to the powerful temporal muscles which act upon and are inserted into the base of the lower jaw. The several bones of the face, and consequently those of the jaw, bear a remarkable contrast to the same osseous elements in the order previously considered; for, whereas in the latter we invariably notice a more or less marked attenuation towards the snout, in the lion and other typical Carnivora we find the facial bones terminating abruptly in a broad and short muzzle. The orbital fossæ are spacious, in order to accommodate the largely-developed eyes. That part of the temporal bone immediately connected with the function of hearing, is remarkably developed for the purpose of exaggerating the power of appreciating the most delicate sonorous vibrations—a circumstance obviously connected with the animal's nocturnal habits. From the internal surface of the occipital and parietal bones a peculiar shelf-like osseous plate projects, so as to divide the cerebral cavity into two or more parts; in the living state these osseous laminae occupy the narrow interspaces between the principal divisions of the brain, and they are evidently intended to protect the great nervous centre from injury, during the violent and oft-repeated shocks to which the animal's habits necessarily expose it. The prodigiously strong jaws are armed with thirty teeth, twelve of these being well-developed incisors, six above and the same number below; the four canines are long and stout, having almost the appearance of

tusks, while the majority of the molars are trenchant or cutting, two only being tuberculated, and these belonging to the upper series. In other Carnivora we find a larger number of tuberculated molars; and so uniformly is the balance of structure and function marked by this peculiarity, that the degree of tuberculation on the one hand, and of sharpness on the other, affords a very accurate indication as to the amount of carnivory possessed by any one particular species. According to Professor Owen, only four of the fourteen molars are true, the other ten being what are termed spurious, false, or pre-molars. The vertebral column of the lion is amazingly strong, yet, at the same time, very flexible; this combination of strength and elasticity being particularly well seen in the bones of the neck, where the first two segments, termed the *atlas* and *dentata*, are remarkably enlarged, the transverse processes of the former and the spinous process of the latter also affording admirable support and attachment to those muscles which act upon the occiput. There are thirteen ribs, but the number varies in different genera. The skeletal elements of the fore-limbs display evidence of great power. The scapula or shoulder-blade, is particularly broad; the upper end of the humerus, or arm-bone, R, is specially enlarged to give insertion to the strong muscles of the shoulder; the radius, S, and the ulna, T, together with the bones of the carpus, U, and metacarpus, V, are likewise correspondingly stout and powerful. In the lion and other *digitigrade* Carnivora—that is, those which walk on the tips of their toes—the ultimate digital phalanges, W, are curiously modified for the support and protection of their terrible claws. The extremity of each phalanx is invested by the hooked nail, the base being also deeply grooved and hollowed out for the lodgement and fixation of its root. With regard to the posterior pair of limbs, the femora, H, tibiae, I, and fibulae, K, do not exhibit any more remarkable features than those referable to an increased power; the calcaneum or heel-bone, L, is bulky, and with the metatarsals, M, directed vertically upwards. This arrangement facilitates the actions of springing and leaping. The

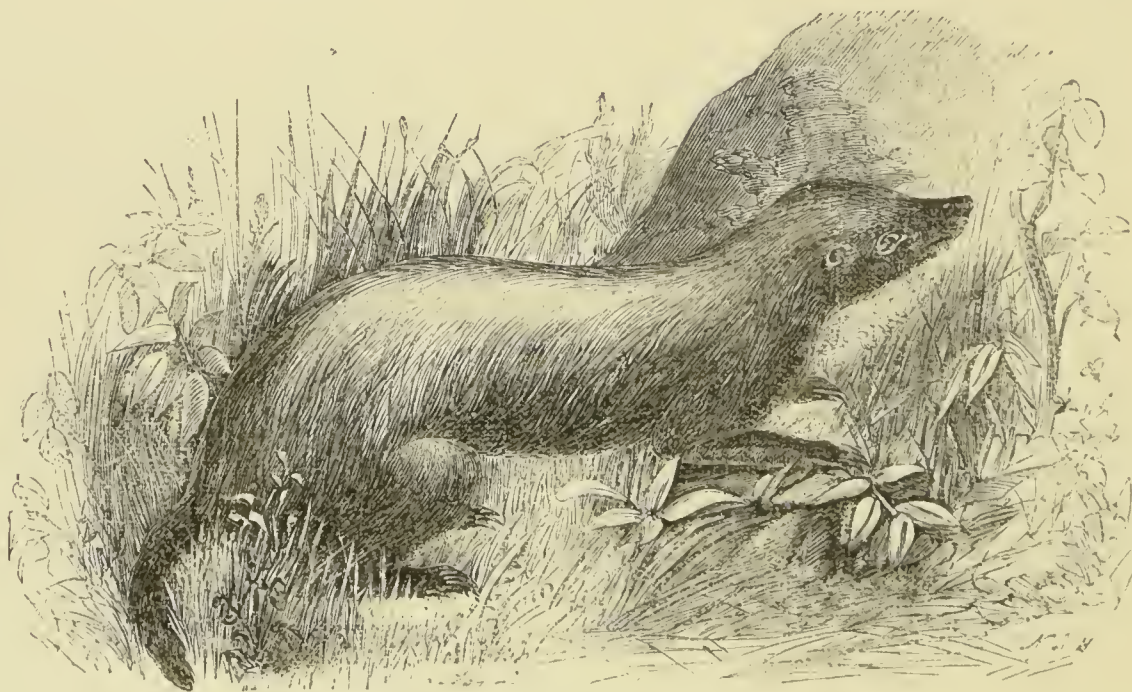
digital phalanges, *N*, closely resemble those of the fore-feet. Such is a brief sketch of the more striking peculiarities seen in the skeleton of the lion, these characters being for the most part shared by all the more typical members of the order. The variations that occur in aberrant forms will be alluded to in the general remarks given at the head of each separate family.

FAMILY I.—URSIDÆ

The bears differ from the more typical Carnivora in several very important particulars. In the first place, they are plantigrade, applying the entire sole of the foot to the ground during progression; and in this respect, as well as in the circumstance of their nocturnal habits, associated with a comparative slowness of pace, we perceive a close alliance with the *Insectivora*. In the construction of the skeleton also, we find the bones less robust, while their mode of inter-articulation does not admit of the same degree of easy mobility which obtains in the cats. The elongation of the skull contrasts strongly with the short, massive cranium of the lion and tiger. The bears, properly so-called, usually carry forty-two teeth, twelve being incisive, four canine, sixteen spurious, and ten true molars; eight of the latter—that is, two on either side of each

jaw—are tuberculated. The snout is prolonged and abrupt at the tip; it contains internally a movable cartilage. The ears are short, rounded, and erect. The tail is inconspicuous or feebly developed. Different members of the family are severally found inhabiting various parts of the globe. Their food is of a mixed character, scarcely anything being refused, whether animal or vegetable; this corresponds with the dentition, which, as we have seen, is even more frugivorous than carnivorous. The majority of the species are stout, thickset animals, and when attacked or excited, they frequently assume an upright attitude, fighting and striking with their powerful hands. They pass the winter in a semi-torpid half-starving condition, retreating for this purpose into dens and holes which they have excavated among the rocks. Fossil remains of bears have been found in the newest tertiary or pleistocene deposits, and in caverns referable to the subsequent glacial period. Among the several extinct forms at present known, the Great Cavern Bear (*Ursus spelæus*) appears to have been the largest, being probably about one-fifth more bulky than any species now living. Caverns containing these remains occur in England, at Kent's Hole near Torquay, in Devonshire; also in Essex, Norfolk, Yorkshire, and Cambridge-shire; as well as in various parts of Germany, Italy, and the south of France.

Fig. 20.



The Ratel (*Mellivora capensis*).

THE RATEL (*Mellivora capensis*).—Following out Cuvier's arrangement as far as possible, we place this interesting animal among the bears; yet, at the same time, we are fully aware that not only the ratel, but also several of the succeeding forms, exhibit, in a structural point of view, many important features in common with the Mustelidæ. On scientific grounds a distinct group might be formed, osculant between the two families; these refinements, however, as well as the more complicated classifications of some recent natural history authorities, would ill serve our present

purpose. The ratel (fig. 20) is an inhabitant of the Cape of Good Hope and the region of the Mozambique. The body is about three feet in length, including the tail, which measures at least six inches; its height from the ground is scarcely one foot. The skin is very dense, the fur consisting of long, stiff, wiry hairs, which are greyish above, inclining to white on the head, but very dark or black on the belly; a white line or stripe separates these two colours. The head is smooth, short, and stout, with an abrupt muzzle; the auricles are small or rudimentary, being repre-

sented only by a slight elevation of the integument round the auditory opening. The teeth are thirty-two in number—that is, twelve incisive, four canine, a dozen spurious molars, and four true ones; none of these so-called grinding teeth are tuberculated, and this peculiarity alone constitutes a distinctive character. The limbs are short, terminating in semi-plantigrade pentadactylous feet, the digits of which are furnished with very powerful claws, and are admirably adapted for the purposes of burrowing. The ratel by this means grubs up the nests of wild bees, and is led to their haunts by watching the behaviour and return of these insects at evening-time. He is said also, like the native Hottentots, to listen to the note of the Honey Guide Cuckoo, which indicates the spot where the desired treasure is to be found. According to Peters, it also feeds on birds, rats, and snakes, a statement which entirely coincides with the opinion formed by a distinguished naturalist who, from a careful examination of the dentition, was led to express the following sentiments:—"It requires," observes Mr. Bennett, "the most positive evidence to convince us that an animal, the number and disposition of whose teeth correspond more closely with those of the cat than any other animal with which we are acquainted, and exhibit a carnivorous character scarcely, if at all, inferior to that which is evidenced by the same organ in the hyænas, should subsist entirely, as from these accounts we are led to believe, upon the petty rapine of a hive of bees and the honied produce of their comb. Still there exist such decisive marks of a diminished capacity for preying on animal food, in the thickset and clumsy form of its body, the shortness of its limbs, its partially-plantigrade walk, the structure of its muzzle, and even in the form of the teeth themselves, as to induce us to pause before we determine to reject the popular testimony as unworthy of credit, although we must regard it as doubtful on some particular points, and insufficient and imperfect on the whole." Messrs. Shaw and Hardwicke have described, in the Transactions of the Linnæan Society, another species of ratel (*Mellivora indica*) inhabiting the upper regions of the Indian peninsula. The tail of this form is shorter, and there is no appearance of the characteristic white band above mentioned.

THE GLUTTON OR WOLVERENE (*Gulo luscus*).—As before remarked, we do not now discuss the nicely-balanced question as to whether the genera here allied together would be more appropriately placed among the weasels or cats. No injury is done to the harmony of zoological sequence by placing these animals side by side with the typical forms of the great ursine group, provided it is understood that we only employ the family title in its most comprehensive signification. The wolverene (Plate 2, fig. 36) is about the size of the common badger, and measures two and a half feet in length, not including the thick bushy tail, which is rather more than half a foot in length, the terminal hairs reaching four or five inches further. The body is strongly arched, especially along the back. The head is broad and pointed at the muzzle, the ears being short, rounded, and partly concealed by the fur. The jaws are provided with thirty-eight teeth—there being

twelve incisors, four canines, sixteen false and six true molars, four of the latter belonging to the lower jaw. The limbs are short, and terminate in semi-plantigrade five-toed feet, the digits of which are furnished with powerful sharp claws. The fur exhibits a dark maroon or reddish-brown colour, becoming almost black as winter sets in; on either side a light reddish band, inclining to white, extends from the shoulder to the hip, but it is more conspicuous in some individuals than in others. The hair of the tail is black, the under part of the throat and chest being more or less marked with pale whitish streaks. In regard to the gluttonous habits of this animal, perhaps no creature has had its digestive capacities more wantonly exaggerated; and in these days it is well that our records of the instincts and habits of various creatures should be marked by the enunciations of sober truth, and the distinctions between fact and mere fiction sedulously maintained. The legendary tales of Ysbrandt, Olans Magnus, Buffon, and many others, in which the ferocity, cunning, and voracity of the glutton are duly set forth, have too often been accepted as embodying actual truths. But by far the best account yet given of this animal is that by Sir John Richardson, who thus fairly estimates his stomachal powers and cunning propensities:—"The wolverene is a carnivorous animal, which feeds chiefly upon the carcasses of beasts that have been killed by accident. It has great strength, and annoys the natives by destroying their hoards of provisions and demolishing their marten traps. It is so suspicious that it will rarely enter a trap itself, but, beginning behind, scatters the logs of which it is built, and then carries off the bait. It feeds also on meadow-mice, marmots, and other Rodentia, and occasionally on other disabled quadrupeds of a larger size. I have seen one chasing an American hare, which was at the same time harassed by a snowy owl. It resembles the bear in its gait, and is not fleet; but it is very industrious, and no doubt feeds well, as it is generally fat. It is much abroad in the winter, and the track of its journey in a single night may be traced for many miles. From the shortness of its legs, it makes its way through loose snow with difficulty, but when it falls upon the beaten track of a marten-trapper it will pursue it for a long way. Mr. Graham observes that the 'wolverenes are extremely mischievous, and do more damage to the small fur trade than all the other rapacious animals conjointly. They will follow the marten-hunter's path round a line of traps extending forty, fifty, or sixty miles, and render the whole unserviceable, merely to come at the baits, which are generally the head of a partridge or a bit of dried venison. They are not fond of the martens themselves, but never fail of tearing them in pieces or of burying them in the snow by the side of the path, at a considerable distance from the trap. Drifts of snow often conceal the repositories thus made of the martens from the hunter, in which case they furnish a regale to the hungry fox, whose sagacious nostril unerringly guides him to the spot. Two or three foxes are often seen following the wolverene for this purpose.' The wolverene is said to be a great destroyer of beavers, but it must be only in the summer when those

industrious animals are at work on land, that it can surprise them. An attempt to break open their house in the winter, even supposing it possible for the claws of a wolverene to penetrate the thick mud walls when frozen as hard as stone, would only have the effect of driving the beavers into the water to seek for shelter in their vaults on the borders of the dam. The wolverene, although it is reported to defend itself with boldness and success against the attack of other quadrupeds, flies from the face of man, and makes but a poor fight with a hunter, who requires no other arms than a stick to kill it." The geographical distribution of the wolverene is co-extensive with the length and breadth of the colder regions of the great North American continent, indications of its presence having been found as far north as Melville Island. The female produces from two to four young ones at a birth, which are clothed with a soft light cream-coloured fur.

THE AMERICAN BADGER (*Meles labradoria*).—This animal is also recognized by the names of the Brairo and Taxel. Mr. Waterhouse and others separate it from the badgers, properly so called; but, as it is closely allied to them in all essential particulars, we prefer to retain the above title. The dental elements correspond numerically with those of the common badger, but their carnivorous character is more marked, although the grinding surfaces of the molars are remarkably flat and even. The length and bulk of the body is similar to that of the glutton. The head is broad, and truncated posteriorly. The ears are short and round, the internal auditory bullæ being largely developed. The fur is coarse and short on the head and limbs, but everywhere else it is beautifully fine and silky, the individual hairs measuring several inches in length. Near the skin, the hair exhibits a purplish-brown colour; the free ends, however, are white, producing a pretty mottled grey appearance. A white band extends from the muzzle over the head along the middle line, gradually disappearing toward the shoulders. The limbs are stoutish, the fore-feet being furnished with strong light-coloured claws, which are longer than those of the common badger. In regard to its habits and geographical distribution, Sir John Richardson states that it "frequents the sandy plains or prairies which skirt the Rocky Mountains as far north as the banks of the Peace river, and sources of the River of the Mountains in latitude 58°. It abounds on the plains watered by the Missonri, but its exact southern range has not, as far as I know, been defined by any traveller. The sandy prairies in the neighbourhood of Carlton House, on the banks of the Saskatchewan, and also on the Red river that flows into Lake Winnipeg, are perforated by innumerable badger-holes, which are a great annoyance to horse-men, particularly when the ground is covered with snow. These holes are partly dug by the badgers for habitations, but the greater number of them are merely enlargements of the burrows of the *Arctomys Hoodii* and *Richardsonii*, which the badgers dig up and prey upon. Whilst the ground is covered with snow, the badger rarely or never comes from its hole, and I suppose that in that climate it passes the winter from the beginning of November to April in a torpid state.

Indeed, as it obtains the small animals on which it feeds by surprising them in their burrows, it has little chance of digging them out at a time when the ground is frozen into a solid rock. Like the bears, the badgers do not lose much flesh during their long hybernation; for, on coming abroad in the spring, they are observed to be very fat. As they pair, however, at that season, they soon become lean. This badger is a slow and timid animal, taking to the first earth it comes to when pursued; and as it makes its way through the sandy soil with the rapidity of a mole, it soon places itself out of the reach of danger. The strength of its fore-feet and claws is so great, that one which had insinuated only its head and shoulders into a hole, resisted the utmost efforts of two stout young men who endeavoured to drag it out by the hind legs and tail, until one of them fired the contents of his fowling-piece into its body. Early in the spring, however, when they first begin to stir abroad, they may be easily caught by pouring water into their holes; for, the ground being frozen at that period, the water does not escape through the sand, but soon fills the hole, and its tenant is obliged to come out. The American badger appears to be a more carnivorous animal than the European one. A female which I killed had a small marmot, nearly entire, together with some field-mice, in its stomach. It had also been eating some vegetable matters."

THE INDIAN BADGER (*Meles collaris*).—Some naturalists also regard this species as an aberrant form of badger, and they go so far as to place it with the digitigrade teledus! It is an inhabitant of Hindostan, and is commonly called by the natives the *Bhalloo-soor*, or Bear-pig. This title is by no means inappropriate, for, if we are to accept the description of Frederick Cuvier, the combination of swinish and ursine characters is very evident. It is similar to the European form in respect of bulk, but the tail is considerably longer, measuring nine inches. Mr. Johnson, in his "Indian Field Sports," says they "are marked exactly like those in England, but they are larger and taller, are exceedingly fierce, and will attack a number of dogs." The tame specimens kept in the menagerie of the governor-general at Barrackpore, when irritated, gave out a peculiar kind of grunt, and stood up on their hind limbs to show fight precisely in the same manner as ordinary bears. The female appeared more docile than the male. Their movements were sluggish, and they always preferred vegetable to animal food, being particularly fond of bread and fruits. In the wild state, the Indian badger appears to be exceedingly savage. It occurs chiefly in the hilly districts, but is not very abundant anywhere.

THE EUROPEAN BADGER (*Meles taxus*), fig. 21.—Before noticing this creature's habits, we offer a few remarks on the principal characters which distinguish it, especially as we have designedly omitted entering upon minute details in our description of the two preceding aberrant forms. The body is broad and depressed, and is furnished with short powerful limbs, terminating in plantigrade, pentadactylous feet, whose digits are armed with long, powerful, fossorial claws. The fur consists of shaggy, coarse, bristly hairs, those on

the belly touching the ground during progression. The head is remarkably long and attenuated in front. The ears are short, almost concealed, and placed well back. The mouth is provided with thirty-six teeth, of which there are twelve incisors, four canines, sixteen spurious, and four true molars, a moiety being appropriated by either jaw. The back is feebly curved, the tail being particularly short and only reaching down to the middle of the limbs. One of this animal's most remarkable peculiarities consists in the presence of a

Fig. 21.

The European Badger (*Meles taxus*).

glandular pouch situated under the tail. This organ, which also exists in many other carnivorous animals, such as the skunks and weasels, secretes an unctuous oily material having a disgusting fetid odour. It is this circumstance which has suggested the common proverb, by which ill-savoured matters are said to "stink like badger." With regard to the varied colour of the fur, Mr. Ogilby gives the following minute description:—"The head of the badger is white, except the region beneath the chin, which is black, and two bands of the same colour, which rise on each side, a little behind the corners of the mouth, and after passing backwards and enveloping the eye and ear, terminate at the junction of the head and neck. The hairs of the upper part of the body, considered separately, are of three different colours—yellowish-white at the bottom, black in the middle, and ashy-grey at the point; the last colour alone, however, appears externally, and gives the uniform sandy-grey shade which covers all the upper parts of the body. The tail is furnished with long, coarse hair of the same colour and quality, and the throat, breast, belly, and limbs are covered with shorter hair of a uniform deep black." The European badger can scarcely be considered a common animal. It is by no means abundant on the continent, while in this country it appears to be rapidly approaching extinction. It has lost its ursine companion of former days, and in a few centuries more our persecuted friend will probably be better known by his fossil remains than by the smell of his greasy fur. At, or immediately succeeding, the close of the glacial period, he associated himself with several species of bears and hyænas, whose specific characters and habits are only known to us by the bony relics they have left in caverns and among the

sands of time. A master hand has thus portrayed the habits of a living badger:—"Heavy, sleepy, and slothful, endowed with but a moderate degree of intellect, and with instincts dull and obtuse, it yet possesses a character and qualities which, if not peculiarly interesting and intelligent, are far from being disgusting and ferocious; and, if it do not boast the admirable sagacity and lively attachment of the dog, it is yet free from the cunning and rapine of the fox, and the fierceness and treachery of the cat. Its favourite haunts are obscure and gloomy. It retires to the deepest recesses of woods, or to thick coppices covering the sides of hills; and there with its long and powerful claws, digs for itself a deep and well-formed domicile, consisting of more than one apartment, the single entrance to which is by a deep, oblique, and even tortuous excavation. The general form of the elongated but robust body, the long taper muzzle terminating in a movable snout, the hard coarse hair, the loose and leathery skin, the low and plantigrade limbs, and the fossorial character of the claws—combine to fit the badger for a subterranean abode, and to enable it to form that abode by its own labour. There it sleeps during the greater part of the day, coming abroad only for a short period in the evening or night to seek its sustenance, in the choice of which it exhibits as completely an omnivorous character as perhaps any animal with which we are acquainted. Its food, in fact, consists indifferently of various roots, earth-nuts, beech-mast, fruits, the eggs of birds, some of the smaller quadrupeds, frogs, and insects. Buffon states that it digs up wasps' nests for the sake of the honey—a fact which has received an interesting confirmation from the observation of a correspondent of *Loudon's Magazine of Natural History*, who seems, however, to attribute the destruction of these nests to the fondness of the badger for the larvæ of the wasp, as he says that the combs were found scattered about, but none were left that contained the maggots." Mr. Bell also observes, further on, in regard to the methods of taking this animal—"The favourite mode, and that which is perhaps the most successful, is by catching him in a sack placed at the entrance of his hole. The haunt of a badger being ascertained, a moon-light night is chosen when he is out feeding, and a small sack is placed within the mouth of the hole, fastened at the outside, with the mouth of the bag outwards, and having a running string round it. Two or three couples of hounds are then thrown off at some distance, and as soon as the badger hears their cry, he makes for his home with all speed, and runs into the sack, which closes behind him by the tightening of the running string at its mouth. Another method is by digging him out. This, however, is laborious and not always successful, particularly in sandy soils, in which the badger will easily foil the dogs which pursue him in his subterranean passages, by throwing the earth back upon them, and blocking up their way, whilst he takes advantage of their loss of time, and makes his way to the surface." The nest of the badger is made of soft herbage, especially moss and grass. The female produces three or four young ones at a birth, the cubs being suckled for about five or six weeks, after which

they are permitted to help themselves. If captured while still young, they are readily tamed, and become very playful and agreeable companions. Notwithstanding, however, all that has been recorded in their favour, we do not ourselves either propose or recommend the rearing of a family of badgers. We heartily rejoice that the barbarous custom of badger-baiting has now completely passed away; but we still recollect an exhibition of this kind some twenty years ago, in a village in the county of Suffolk, since which time various societies have been established throughout the kingdom for the humane purpose of suppressing cruelty to noxious as well as inoffensive animals.

THE KINKAJOU (*Cercoleptes caudivolvula*).—By some authors the kinkajou is placed among the Viverridæ. Although its general aspect would at first naturally lead us to coincide with such an arrangement, yet its structural characters are evidently more intimately associated with the Ursidæ, and consequently we have introduced it in this place. Unlike the badgers, its head is short, rounded, and more resembling the apes, the muzzle being only very slightly produced. The jaws are furnished with thirty-six teeth, there being twelve incisors, four canines, twelve spurious, and eight true molars. The two anterior grinders on either side, above and below, are conical, the remainder being tuberculated. Their crowns are also flattened, those of the lower jaw having an oblong form, while the upper series are a little widened transversely. The tongue is slender and extensile. The body is cylindrical, a good deal curved posteriorly, and terminates in a long prehensile tail. According to Mr. Blyth, its capacity of employing the tail as a fifth limb is very limited; for he says—"One which I had an opportunity of studying as it ran about loose in a room, possessed the prehensile power of the tail in an extremely moderate degree, merely resting slightly on this organ, which it stiffened throughout its length, and never coiled in the manner of the Sapajous." Frederick Cuvier's figure represents the tail several times coiled upon itself. The feet are five-toed and plantigrade. The fur is thick and woolly, and of a golden-yellow brownish colour. The kinkajou is an inhabitant of the tropical parts of America, and of the principal West India islands. It is strictly arboreal and nocturnal in its habits, cautiously moving to and fro, and feeding on fruits, honey, milk, insects, eggs, small birds, and quadrupeds. Its disposition appears to be peculiarly mild and gentle.

THE BROWN COATIMONDI (*Nasua narica*).—Plate 11, fig. 38.—The genus *Nasua* includes two or more species of coati, of which this is probably the best known form. It is distinguished by the presence of white patches over the eye and muzzle. In the red coati, on the other hand, the snout is quite brown, the fur, generally, being of a rufous-fulvous hue. Without, however, insisting very strongly on these specific distinctions, we may observe that the coatis are characterized by the possession of an elongated head, the muzzle being extended into a movable proboscis. The superior border is particularly narrow, while the tip is slightly turned upwards. The ears are short, broad, and oval. The jaws are provided with forty

teeth; that is to say, twelve incisives, four canines, sixteen premolars, and eight true molars. The canines are somewhat compressed, and have sharp points. The molars are comparatively small, three of the lower series being narrower than those of the upper. These animals are eminently arboreal in their habits, and consequently we find their plantigrade, pentadactylous feet admirably adapted for the purposes of climbing. The hinder feet are semi-palmate, and so freely do the tarsal bones move upon the leg, that when descending head-foremost they almost hang by them; their ordinary position, as maintained in walking, being nearly reversed. The toes are connected by an extension of the skin, and are provided with long, compressed, incurved claws. These they employ in digging up earthworms and various subterranean insects. They also feed upon slugs, snails, small quadrupeds, and more particularly upon eggs, birds, and various kinds of fruit, and vegetables. In short, nothing seems to come amiss, and their appetite is extremely vigorous. Before they actually devour the flesh of animals, they are careful to tear it in pieces and detach it. Without entering at any great length into the structure of the skeleton, a drawing of which is given in Plate 34, fig. 113, we may remark a general slimness of the several osseous elements of which it is composed. It may also be observed that the elongated head slopes very much backwards, while the degree of this animal's carnivory is shown by the aspect of the teeth already described, and more particularly by the sharp, prominent, occipital crest and ridge, which afford attachment to the powerful muscles of the neck—an arrangement enabling the animal to raise its head rapidly with great force, so as to impart to the jaws the necessary aid in tearing away the soft flesh from off the bones of its victims. We may likewise notice one other more remarkable peculiarity in the skeleton. It is seen in the curious fact that only a single bone or vertebral segment is found to represent what is termed the *sacrum*, while in the typical bears and carnivores, properly so called, there are always three or four conjoined osseous elements, and in the polar bear as many as seven. This phenomenon probably bears some relation to the arboreal habits of the coati, and this power of climbing requires, as we have seen, the utmost freedom of motion in the hinder parts of the body, while it forms an interesting contrast with the consolidated chain of bony elements witnessed in the slow-moving bears. The tail of the coatimondi is very long, and is marked externally by numerous annulations, depending upon the alternating dark and light-brown hairs which extend from the root to the tip. In other parts of the body the colours are more or less uniform, and, from the observations of the Prince of Neuwied, it would appear that the slight differences of colour occurring in the fur of various individuals, are entirely insufficient to indicate the correctness of those specific definitions which have hitherto been regarded as established.

THE BINTURONG (*Ictides albifrons*) approximates very closely to the racoons, especially in the form of the skull. It is an inhabitant of the isles of Borneo, Malacca, Sumatra, and the western parts of Java,

where it is also known as the Palm-civet or Musang. The head is short and pointed anteriorly. The body is clothed with long hair, which is generally of a grey colour, the tail and sides of the muzzle being black. The whiskers are extensively developed, forming a very conspicuous feature. The eyes are cat-like, with the pupil elongated from above downwards, the small and rounded ears being covered with a tuft of pencilled hairs. The jaws are armed with thirty-eight teeth; that is, twelve incisors, four canines, sixteen spurious, and six true molars, only two of the latter occurring in the lower jaw. The feet are entirely plantigrade and pentadactylous. The tail is remarkably long, stoutish throughout, more particularly at the root; it is also prehensile. According to Sir Stamford Raffles, the Binturong is slow and heavy in its movements, sleeping for the most part during the day, and at night wandering about in search of food. It appears to enjoy both an animal and vegetable diet, having however, a decided preference for the former. It climbs trees with tolerable facility, being greatly assisted by the strong prehensile tail.

THE PANDA (*Ailurus refulgens*) comes still nearer to the racoons, and consequently to the bears proper. It is an inhabitant of the Himalayas, between the snowy mountains and Nepaul. The body is stout, and covered with a soft thickly set fur. It is of a rich cinnamon colour on the back, fulvous posteriorly, and of a deep black hue beneath. The tail is as long as the body, tolerably thick throughout, especially at the root, and is annulated with dark brown bands. The head is short, broad, rounded, and clothed with whitish hair. The ears are small, arched, and pointed. The eyes are placed well forward. The jaws support thirty-six teeth; that is, twelve incisive, four canines, sixteen spurious, and four true molars. The limbs are short, the soles of the plantigrade five-toed feet being furnished with fine downy hairs. The claws are compressed, curved, retractile, and very sharp. Altogether, this animal is a handsome species. Respecting its affinities with certain allied forms, General Hardwicke states, that the peculiarities "on which its rank as a genus depends are striking and prominent; but its disposition in a natural series is still obscure, as it resembles in several characters the individuals of that subdivision of digitigrade Carnassiers, from which it differs essentially both in its teeth and in its plantigrade walk. Among the peculiarities of our animal are to be noticed, the great breadth of the rostrum and the singular structure of the teeth; but the most remarkable character, and that on which its distinction principally depends, is the form of the projecting points of the posterior grinders. This character, as far as our observation extends, is peculiar. It does not exist, except in a small degree, in any other genus of carnivorous quadrupeds." Comparing it with the genera *Nasua* and *Procyon*, he adds—"These differ essentially in the lengthened form of the head and in the extended rostrum, which is terminated by a flexible rhinarium. They also differ in the number, character, and distribution of the grinders. *Nasua* and *Procyon* have in both jaws six grinders, of which the three anterior are false; and of

those which follow, none of the points even in the adult state exhibit the truncation above described." The habits of the Panda are strictly arboreal, the animal being particularly abundant in the neighbourhood of running streams and mountain torrents. It utters a peculiar cry resembling the syllable *wha*, and is consequently sometimes called by the natives the *Chitwa*. Its food consists chiefly of small quadrupeds and birds.

THE RACCOON (*Procyon lotor*)—Plate 11, fig. 37—is characterized by the possession of an acute fox-like muzzle, associated with an attitude thoroughly ursine and plantigrade. During progression, however, the heel is slightly elevated. The posterior part of the head is more or less rounded. The ears are oval and a little pointed. The eyes are large and penetrating, having spherical pupils. The nose is soft, naked, tapering, and projecting considerably beyond the mouth. The jaws carry forty teeth; that is, twelve incisors, four canines, sixteen spurious, and as many as eight true molars. The body measures about two feet in length, exclusive of the tail; but it stands low, the back being scarcely a foot from the ground. The limbs are short and narrow, when compared with the preceding genera. The feet are pentadactylous, the digits being clothed and armed with strong falciform claws. Its tail is about ten inches long, and annulated by alternating bands of dark, black, and whitish hair, the latter being thick and much elongated. The fur is for the most part of a greyish-brown colour. On the head a brownish-black streak runs down the central line from between the ears to the tip of the nose, and on either side, below the eyes, there is an oblique patch of a similar colour. Over the eyebrows, and towards the muzzle, the hair is whitish. This is also the case with the ears. The whiskers are well developed. Under the belly the fur is much lighter than on the back. The Raccoon has an extensive range over the upper parts of the North American continent. In regard to its habits, Sir John Richardson thus speaks of it:—"In the wild state it sleeps by day, comes from its retreat in the evening, and prowls in the night in search of roots, fruits, green corn, birds, and insects. It is said to eat merely the brain, or suck the blood of such birds as it kills. At low water it frequents the sea-shore to feed on crabs and oysters. It is fond of dipping its food into water before it eats, which occasioned Linnæus to give to it the specific name of *lotor*. It climbs trees with facility. The fur of the Raccoon is used in the manufacture of hats, and its flesh, when it has been fed on vegetables, is reported to be good."

THE BROWN BEAR (*Ursus arctos*).—Almost every one is familiar with this common species, which has a very wide geographical distribution over the northern half of the eastern hemisphere, extending from Spain and the west of Europe, to the extreme eastern parts of Asia and the islands of Japan. It is also now generally believed that the Barren-ground bear is only a variety of this species—an opinion in which we are disposed to acquiesce; and if this persuasion be correct, *Ursus arctos* must be considered an American as well as European species, which would give it a range coex-

tensive with the circuit of the globe. As the name indicates, the general colour of the fur is brown; but it is subject to a great variation of tint, partly depending upon age and partly also on locality—circumstances which have given origin to several well-marked varieties. In the young state the texture of the hair is woolly; but it becomes firm and even in the adult condition. The whitish bands seen on the neck and sides of the head in the Siberian variety of this bear, are, it would seem, merely the permanent indications of the pale collar which is commonly more or less marked in young specimens of the European form. Like all the true ursine types of structure, the common brown bear possesses a stont bulky frame and powerful thick limbs (fig. 22). The forehead is slightly con-

vex, while the ears are short. Its habits are solitary. The flesh is very good eating, especially when the animal is young. The fur is valued everywhere, and more particularly by the Laplanders and the Kamtchatkans, to whom, Mr. Ogilby remarks, "it gives the necessities and even the comforts of life. The skin, we are told, forms their beds and their coverlets, bonnets for their heads, gloves for their hands, and collars for their dogs, while an over-all made of it, and drawn over the soles of their shoes, prevents them from slipping on the ice. The flesh and fat are their dainties. Of the intestines they make masks or covers for their faces to protect them from the glare of the sun in the spring, and use them as a substitute for glass by extending them over their windows. Even

Fig. 22.

The Brown Bear (*Ursus arctos*).

the shoulder-blades are said to be put in requisition for cutting grass." As a source of sport, it was in early times the custom for English sovereigns and nobility to assemble together to witness the baiting of this unfortunate animal. We rejoice to know that those barbarous customs have long since passed away, and those who wish to indulge in a fairer and more legitimate amusement must betake themselves to the mountains and well-wooded districts of Europe and Asia, where they will find ample opportunities for developing their skill and courage, and, at the same time, confer a positive boon upon the inhabitants of many an outlying, lonesome, hill-begirt village. Although the behaviour of these animals is far less alarming than that of lions, tigers, and their congeners, yet their pursuit is by no means unattended with danger, and it requires great courage to attack them. Among the many interesting stories which have from time to time appeared respecting encounters with this animal, we are not acquainted with any more daring or des-

perate than those which have been recorded by Mr. Atkinson in his attractive work entitled "Oriental and Western Siberia." While in the neighbourhood of the celebrated Tsaravo-Nicholiovsky gold mine, two men, one of them being a skilled hunter, succeeded in springing a bear. "The hunter fired, and the ball struck, but not in a vital part. In an instant the wounded animal charged. The other man, who was less experienced, reserved his shot until within twenty paces. The rifle missed. At once the brute raised himself on his hind legs, and tearing the earth beneath him, rushed on his first assailant, striking him down with a blow that stripped his scalp, and turned it over his face. Then seizing his arm, he began to gnaw and crush it to the bone, gradually ascending to the shoulder. The man called to his companion to load and fire; but the fellow, when he saw his friend so fearfully mangled, ran away and left him to his fate. Late in the evening he reached the gold mine and reported what had happened; but it was too late to

make any effort in behalf of the mangled hunter. The officer ordered a large party out at day-light the next morning with the coward for a guide. He took them through the forest to the spot where the encounter had taken place, of which there still remained ample evidence; but no remains of the victim were met with, except some torn clothing and his rifle. By the state of the grass it was evident that the man had been carried off into the thick forest. A most diligent pursuit was therefore made. Sometimes the track was lost; but the pursuers of the bear were too well skilled in wood-craft to be foiled, and at length discovered his larder. He had dragged the hunter into a dense mass of wood and bushes, and, to render the place still more secure, had broken off a quantity of branches and heaped them over his body. These were quickly stripped off, when, to their great surprise, they found the man, though frightfully mutilated and quite insensible, still living! Two long poles were immediately cut, to which saddle-cloths were secured in the middle. One horse was placed in front, another at the back, and the ends of the pole secured to the stirrups, thus forming a very easy conveyance. The sufferer was placed upon the saddle-cloths, and carefully propped up, and then began the painful march back as fast as possible. On their arrival at the gold mine he was taken direct to the hospital. The doctor dressed his wounds, and administered all that medical skill and kindness prompted. His patient survived, but long remained unconscious of everything around him. After more than two months had elapsed a slight improvement took place, and his reason appeared to be restored. His first question was about the bear, and then he referred to his own defeat. He spoke of nothing else, and was constantly asking for his rifle to go and kill 'Michael Ivanitch' (the bear). The medical men thought his mind seriously affected. As he gained strength there arose in him so great a desire to have another combat with his powerful and ferocious enemy, that it was considered necessary to place him under some restraint. Summer had passed over, and autumn had arrived; the sun had scorched the foliage, changing it into golden and crimson hues, and as it was now thought the poor lunatic had forgotten his adventure, less vigilance was exercised towards him. The opportunity was not lost; for he secretly left the hospital, and started off for his cottage. All the family being absent, except some young children, he was enabled to secure his rifle and ammunition, and provided himself with an axe and a loaf of black bread, which he stowed in his wallet. Thus armed and provisioned, he left the village in the evening without having been seen, except by the children, and was soon lost to them in the forest. When it was discovered that he had escaped, people were sent out in various directions to seek him; but they returned without success. More than a week passed over, during which nothing had been heard of him, when one day he walked into the hospital, carrying the skin of a huge bear on his shoulders, and throwing it down exclaimed, 'I told you I would have him.' This man was a fine old hunter. It was not a spirit of revenge which prompted him to this daring act.

The fact was he could not brook the idea of a defeat. Now his reputation was re-established, he was happy. His health was again restored; nor was this the last bear that fell before his deadly rifle." Not only do the men of these regions courageously attack bears, but women also take to hunting, one of them having obtained an extraordinary reputation for her skill and daring. Throughout Siberia, Bruin is said to have no more intrepid enemy than the damsel, Anna Petrovnaia! The closing scene of one of her expeditions is thus described by Mr. Atkinson:—"As she was creeping cautiously forward, out rushed the bear with a loud growl, about twenty yards in front. Quickly she threw forward the prongs of her rifle, dropped on one knee, and got a good sight of the animal staring at her, almost motionless. She now touched the trigger, there followed a flash, a savage growl succeeded, then a struggle for a minute or two, and her wish was accomplished—the bear lay dead." Since this event, we are informed that she has destroyed no less than sixteen bears! Here we would willingly quit the subject, but cannot do so without also recording the most desperate encounter probably ever placed on record. This took place not far from the district in which the poor hunter above mentioned was so terribly mangled. One afternoon, says Mr. Atkinson, a Cossack officer "was quietly strolling through the forest, alone and unarmed, botanizing by the way, when, at a distance of about eight versts from the gold mine, he came out of the forest into an open glade, on which stood some single trees. Almost immediately on entering this spot, he observed at a distance of two hundred paces a she-bear and her two cubs playing together. The moment she became aware of his presence, she uttered a savage growl, drove her young ones into a tree for shelter, and mounted guard at the foot of it to defend them. The Cossack retreated into the wood to provide himself with a weapon, having determined to carry off the cubs. The woodmen had been cutting timber, and from the stems of several young birch trees lying on the ground, he selected part of a strong one, nearly four feet in length, tried its quality against a tree in a succession of smart blows, and then club in hand, retraced his steps. As soon as the old bear observed his approach she began to growl furiously, moving to and fro with an uneasy motion at the foot of the tree. He slowly and steadily advanced, when within about a hundred paces her growl became more savage, and her actions showed that she intended mischief. Nevertheless he quietly moved on, his keen eye steadfastly fixed upon her. The ground was a fine grassy turf, with no shrubs or bushes to impede his movements or entangle his feet. When within about fifty paces, she made a savage rush that would have daunted most men; but he firmly stood his ground, waiting her nearer approach. At this moment the cubs began to whine, and she trotted back towards the tree in increased fury. The Cossack followed, and when she turned round, they were face to face, within twenty paces of each other. There was now no retreat. The brute eyed him keenly for two or three minutes, as if calculating his strength; he returning her gaze with as searching scrutiny. Presently

she made a second rush, her eyes glaring like balls of fire. At a few paces from her enemy she rose on her hind legs, intending to give him a settler with her powerful paws, or to clasp him in her savage embrace; but on the instant, he made a sweep with his club, and dealt a blow that toppled her over. She was up again in a second, and ready for action, but another blow laid her prostrate. This added to her ferocity, and it at once became a close encounter of the most deadly and savage character. Many rounds were fought, her antagonist keeping clear of her paws. At last the blows began to tell on her courage. She endeavoured to get behind him; but his cudgel met her at every turn, and was so well wielded that whenever within reach she received a stroke which drove her back step by step, till both came under the tree. Here the fight was renewed with increased fury, and every time the cubs whined she made her attack with redoubled violence. The battle continued to rage furiously; but the blows from the staff fell so fast, and were applied with so much force, that at last she began a retreat towards the forest, the skirts of which she entered; but the moment her brave assailant moved a step towards the tree, she would rush out, taking especial care, however, not to come within his reach. The cubs remained in the branches the sole spectators of this extraordinary scene; nor could the Cossack officer devise any plan by which he could get them down. At their respective posts the combatants stood, he guarding the cubs, and the mother standing at the edge of the forest. At this time a woodman returning to the gold mine, rode into the glade. He was instantly hailed, and rode towards the tree; but when he heard the growls, and beheld the bear, then in her most savage mood, his natural impulse to bolt was only checked by the fear of a birching promised by his superior. He was ordered to dismount, and take from his saddle the *zumka* (large leathern bags), and open them; then to climb the tree, and bring down the cubs. The man was soon up among the branches, secured a cub, brought it down, and then tied it safe in the bag. The other was also quickly placed beside it in the other bag. During these operations the mother rushed at the Cossack, and was several times knocked down by his weapon. The peasant was now ordered to place the bags on his horse, and lead the way to the gold mine, the Cossack covering the retreat, and beating off the enemy at every charge. After a walk of nearly two hours, they reached the village, the bear keeping close up with them. As they went through the forest, she made many charges, but each time was laid prostrate, and finally would not approach within striking distance. When they reached the village the Cossack officer hoped to secure the dam; but after following them to the cottages, she returned to the forest, and was never seen again. The cubs were kept, and became great pets with the people. Even the hardy hunters of Siberia consider this a most daring feat, wondering at the power, and admiring the cool courage of the man who accomplished it." Mr. Atkinson records many other pleasing adventures and interesting facts connected with the Siberian bear. Like most other

quadrupeds, this animal has a great fear of fire; but when pressed with hunger he will, in order to seize any person who may be reposing by a fire in fancied security, deliberately enter some stream, and having saturated his fur with water, put out the fire by rolling over it, and then secure his victim. Bears have been known, even in the wild state, to show attachment to young people; and the same author mentions an instance where two young children, two and four years of age respectively, had wandered from a hay-field where their parents were at work, and when the father and mother went to look for them, lo and behold! one was sitting on a huge bear's back, whilst the other was feeding the beast with wild fruit! The children readily came away at their parents' alarming calls, and Bruin seemed vexed to part with his joyous little companions.

THE SYRIAN BEAR (*Ursus syriacus*). — This appears to be a well-marked species; the fur is of a fulvous or light-brown colour, whilst on the upper part of the neck there is a mane of thick rigid hairs, which increase in length towards the shoulders, terminating posteriorly about the centre of the back. The Syrian bear, though often feasting upon animals, is said to be particularly partial to certain kinds of vegetable food, and more especially to the chick-pea, *Cicer arictinus*, entire crops being laid waste by its ravages.

HORSFIELD'S BEAR (*Ursus isabellinus*) is an inhabitant of the entire Himalayan chain of hills, and, like the foregoing species, is of a pale fulvous colour; it is, however, quite a distinct form. According to Dr. Horsfield, it resembles "the European bears in its structure, as far at least as can be determined from the parts which have been preserved in the specimen (procured from Nepal). Among these, the claws afford the best means of comparison; they are small, obtuse, and straight; while those of the Asiatic bears (*U. thibetinus*, *U. labiatus*, and *U. malayanus*) are large, strongly-curved, acute, and fitted for climbing."

THE SLOTH BEAR (*Ursus labiatus*) exhibits so striking a resemblance to a sloth, that when it was first made known to Europeans, it was actually described as a species of *Bradypus*. Some confusion has arisen respecting it, partly perhaps on account of the varied nomenclature by which it has been indicated; thus it is called the Ursine sloth, the Labiated bear, the Jungle bear, and one author denominates it the Bengal bear. It is an awkward, unwieldy animal. The body is clothed with thickly-set, black, shaggy hair, which becomes much longer when the animal is old. The head is depressed and attenuated in front, the nasal cartilage being movable and extensible. The lips are capable of protrusion, this being especially the case with the lower one. Captain Thomas Williamson, in his "Oriental Field Sports," remarks that "the Bengal bear is distinguished by the deep black colour of his hair, and by a crescent of white hair, like a gorget, on his breast. The hind legs are shorter, and the paws flatter and longer than those of the European breed; his pace is more shuffling, awkward, and laboured, though quick enough to overtake a man on foot; and his hair is long and thinly scattered over his body. He is remarkably active in climbing; frequently, when net

more than a month old, a cub will ascend to the shoulder of his keeper with great ease, and descend again, stern foremost, with equal adroitness." Its food consists chiefly of fruits, honey, and white ants, of which latter it appears to be particularly fond. When the Bengal bear "finds a nest of any kind of ants, but especially white ants, he is in his glory! he tears the whole burrow, licking up all the clusters he can get at, and lying with his tongue out to entice the little prey into his mouth. By this means, he no doubt often obtains an ample meal; for I think I may with propriety assert that frequently a bushel of white ants may be found in the same nest. The presence of bears in the vicinity of a village is generally pretty well known by the nature of the covers, and their having been, perhaps time out of mind, regular visitors; sometimes, however, they change their haunts, on which their neighbourhood is commonly first discovered by the ant-hills and burrows near the sides of roads being found in a state of destruction." Their food, however, does not appear to be confined to insects and fruit, for the same naturalist observes that they will attack and devour quadrupeds, and even man himself. He gives the following sad account of their behaviour:—"It has often been in my way to see the operations of bears; and I am confident that no animals exist more cruel, more fierce, nor more implacable than they are! Such as have suffered under their brutality have in all instances within my knowledge borne the proofs of having undergone the most dilatory torments. Some have had the bones macerated, with little breaking of the skin; others have had the flesh sucked away into long fibrous remnants, and, in one instance, the most horrid brutality was displayed. While stationed at Dacea, I went with a party several times to the great house at Tergong, distant about five miles from the town. I had on several occasions seen bears among the wild mango topes, and did not consider them as being so dangerous, until one day as I was returning with a friend from hunting some hog-deer, we heard a most lamentable outcry in the cover through which we had to pass. Having our spears, and being provided with guns, we alighted, not doubting but a leopard had attacked some poor woodcutter. We met a woman whose fears had deprived her of speech, and whose senses were just flitting. She, however, collected herself sufficiently to pronounce the word *bauloo*, which signifies a bear. She led us with caution to a spot not more than fifty yards distant, where we found her husband extended on the ground, his hands and feet, as I before observed, sucked and chewed into a perfect pulp, the teguments of the limb in general drawn from under the skin, and the skull mostly laid bare, the skin of it hanging down in long stripes, obviously effected by their talons. What was most wonderful was, that the unhappy man retained his senses sufficiently to describe that he had been attacked by several bears, one of which had embraced him about the head and bit at his arms and legs, seemingly in competition for the booty. We conveyed the wretched object to the house, where, in a few hours, death relieved him from a state in which no human being could afford the smallest assistance!" The Bengal bears appear to be

abundant on the eastern side of the Ganges, but of late years their number has been very considerably reduced by the skill of our Indian officers, who are notoriously fond of the sport of hunting.

THE MALAYAN SUN-BEAR (*Helarctos malayanus*) is also characterized by the possession of a deep jet-black fur, the hairs of which are, however, comparatively shorter than obtains in the foregoing species, the breast being marked by a white patch of a heart-shaped colour. In the Bornean bear, which we take to be a mere variety of this species, this patch is of a fulvous colour, and likewise deeply notched in front. The Malayan bear feeds chiefly on vegetables and honey, and is said to evince a special predilection for the young shoots of cocoa-nut trees, to which it proves very destructive. The length of the body is about four and a half feet. This animal appears to be easily tamed, if taken whilst still young. Sir Stamford Raffles' account of one in his possession might almost induce us to desire a similar companion. He says, it "was brought up in the nursery with the children, and when admitted to my table, as was frequently the case, gave a proof of his taste by refusing to eat any fruit but mangosteens, or to drink any wine but champagne. The only time I ever knew him to be out of humour was on an occasion when no champagne was forthcoming. It was naturally of an affectionate disposition, and it was never found necessary to chain or chastise him. It was usual for this bear, the cat, the dog, and a small blue mountain bird or *lory* of New Holland, to mess together and eat out of the same dish. His favourite playfellow was the dog, whose teasing and worrying was always borne and returned with the utmost good humour and playfulness. As he grew up he became a very powerful animal, and in his rambles in the garden he would lay hold of the largest plantains, the stems of which he could scarcely embrace, and tear them up by the roots." Of a tame specimen of the Bornean variety, Dr. Horsfield also gave the following interesting account:—"The *Helarctos* readily distinguishes the keeper, and evinces an attachment to him. On his approach it employs all its efforts to obtain food, seconding them by emitting a coarse but not unpleasant whining sound. This it continues while it consumes its food, alternately with a low grunting noise; but if teased at this time, it suddenly raises its voice and emits at intervals harsh and grating sounds. Our animal is excessively voracious, and appears to be disposed to eat almost without cessation. When in a good humour, it often amuses the spectators in a different manner. Calmly seated in its apartment, it expands the jaws and protrudes its long and slender tongue as above described. It displays on many occasions not only much gentleness of disposition, but likewise a considerable degree of sagacity. It appears conscious of the kind treatment it receives from its keeper. On seeing him, it often places itself in a variety of attitudes to court his attention and caresses; extending its nose and anterior feet, or suddenly turning round exposing the back, and waiting for several minutes in this attitude with the head placed on the ground. It delights in being patted and rubbed,

and even allows strangers to do so; but it violently resents abuse and ill-treatment, and, having been irritated, refuses to be courted while the offending person remains in sight." This unfortunate animal died suddenly one summer's morning, after having gorged itself with a too hearty meal.

THE BLACK BEAR (*Ursus americanus*) is a well-known species, inhabiting the American continent from the shores of the Atlantic to the Pacific, and from the Arctic regions to the Isthmus of Panama. The form termed the Spectacled bear, which inhabits the wooded slopes of the Andes and Cordilleras in Chili, is likewise by many naturalists regarded as a mere variety of this species. The American black bear differs only in the non-displayment of certain pale fulvous marks situated on the throat and cheeks, and similar light bands round the eyes from which the Spectacled bear has derived its name. Other varieties of the American black bear have also been described. This species is occasionally as much as five feet in length, but it seldom exceeds that measure. The fur is of a soft even texture, and of a shining black colour. The head is comparatively narrow; the muzzle elongated and pointed. The claws are sharp, strongly curved, and in great part concealed by the hair. Like its congeners, it is partial to well-wooded and rocky grounds. Here it feeds principally upon vegetable matters, but often succeeds in capturing quadrupeds and birds, which it readily devours, as well as fish. When winter approaches, it retires either into the hollow of some tree, or more commonly into a kind of den amongst fallen trees or brushwood, where it digs up the soil in such a way as to scoop out a tolerably secure and snug retreat. A small opening in its snow-clad tenement allows fresh air to enter. The American black bear is naturally timid, nevertheless it is regarded by the natives with considerable dread, chiefly it would appear on superstitious grounds. In proof of this, we produce the following interesting account by Mr. Henry, an early traveller, who was in the neighbourhood of Lake Michigan when the incident which he here describes took place:—"In the course of the month of January, I happened to observe that the trunk of a very large pine tree was much torn by the claws of a bear, made both in going up and down. On further examination, I saw that there was a large opening in the upper part, near which the smaller branches were broken. From these marks, and from the additional circumstance that there were no tracks in the snow, there was reason to believe that a bear lay concealed in the tree. On returning to the lodge, I communicated my discovery, and it was agreed that all the family should go together in the morning to assist in cutting down the tree, the girth of which was was not less than three fathoms. The women at first opposed the undertaking, because our axes, being only of a pound and a half in weight, were not well-adapted to so heavy a labour; but the hope of finding a large bear, and obtaining from its fat a great quantity of oil, an article at the time much wanted, at length prevailed. Accordingly in the morning we surrounded the tree, both men and women, as many at a time as could conveniently work at it; and there we toiled like beavers till the sun went down. This day's work carried us

about half-way through the trunk, and the next morning we renewed the attack, continuing it till about two o'clock in the afternoon, when the tree fell to the ground. For a few minutes everything remained quiet, and I feared that all our expectations would be disappointed; but as I advanced to the opening there came out, to the great satisfaction of all our party, a bear of extraordinary size, which I shot. The bear being dead, all my assistants approached, and all, but particularly my old mother (as I was wont to call her), took the head in their hands, stroking and kissing it several times, begging a thousand pardons for taking away her life, calling her their relation and grandmother, and requesting her not to lay the fault upon them, since it was truly an Englishman that had put her to death. This ceremony was not of long duration, and if it was I that killed their grandmother they were not themselves behind-hand in what remained to be done. The skin being taken off, we found the fat in several places six inches deep. This being divided into two parts, loaded two persons; the flesh parts were as much as four persons could carry. In all, the carcass must have exceeded five hundred weight. As soon as we reached the lodge the bear's head was adorned with all the trinkets in the possession of the family, such as silver arm-bands and wrist-bands, and belts of wampum, and then laid upon a scaffold set up for its reception within the lodge. Near the nose was placed a large quantity of tobacco. The next morning no sooner appeared than preparations were made for a feast to the manes. The lodge was cleaned and swept, and the head of the bear lifted up, and a new Stroud blanket which had never been used before laid under it. The pipes were now lit, and Wawatam blew tobacco smoke into the nostrils of the bear, telling me to do the same, and thus appease the anger of the bear on account of my having killed her. I endeavoured to persuade my benefactor and friendly adviser that she no longer had any life, and assured him that I was under no apprehension from her displeasure; but the first proposition obtained no credit, and the second gave but little satisfaction. At length, the feast being ready, Wawatam made a speech resembling in many respects his address to the manes of his relations and departed companions, but having this peculiarity that he here deplored the necessity under which men laboured thus to destroy their friends. He represented, however, that the misfortune was unavoidable, since without doing so they could by no means subsist. The speech ended, we all ate heartily of the bear's flesh; and even the head itself, after remaining three days on the scaffold, was put into the kettle." Independent of these statements, we have plenty of evidence that the flesh of the American black bear is excellent eating; and recently Mr. Oliphant, who has enjoyed considerable experience of different kinds of food both in the eastern and western quarters of the northern hemisphere, declares for himself and his companions that it is a "royal feast." In the winter time the female produces from one to five cubs, and in order to secure her progeny from the attack of other animals, such as wolves and the like, she makes her lodging, as we have seen, high up among the branches of thickly-wooded trees.

THE GRISLY BEAR (*Ursus ferox*) is also an American species. Its disposition is exceedingly fierce, and it is endowed with prodigious strength. Its muscular power may be estimated by the circumstance of a specimen of this animal having been seen to carry the carcass of an American buffalo, weighing about one thousand pounds, to a considerable distance. The travellers Messrs. Lewis and Clark measured a specimen which had attained a length of nine feet, and some persons pretend to have met with individuals several feet longer. The head is broad and flattish on the crown, and nearly even from the occiput to the nose, except in old specimens; the ears are short and conical; the muzzle being wide, and of a pale colour. The fur is long and of a deep-brown tint; commercially speaking, it is of inferior quality. Its limbs are powerful, the feet being armed with very long, compressed, white, strongly-curved claws; the inferior border of the latter is particularly narrow. Its rudimentary tail is entirely concealed by the hair. With regard to its habits, the grisly bear is more carnivorous than the preceding species, although it does not refuse to subsist on a vegetable diet if animal food be not forthcoming. Sir John Richardson has given us the following interesting narrative, which he states to be derived from authentic sources:—"A party of voyagers who had been employed all day in tracking a canoe up the Saskatchewan, had seated themselves in the twilight by a fire, and were busy in preparing their supper, when a large grisly bear sprung over their canoe that was tilted behind them, and seizing one of the party by the shoulder, carried him off. The rest fled in terror, with the exception of a Metif named Bourasso, who, grasping his gun, followed the bear as it was retreating leisurely with its prey. He called to his unfortunate comrade that he was afraid of hitting him if he fired at the bear, but the latter entreated him to fire immediately, without hesitation, as the bear was squeezing him to death. On this he took a deliberate aim, and discharged his piece into the body of the bear, which instantly dropped its prey to pursue Bourasso. He escaped with difficulty, and the bear ultimately retreated to a thicket, where it was supposed to have died; but the curiosity of the party not being a match for their fears, the fact of its decease was not ascertained. The man who was rescued had his arm fractured, and was otherwise severely bitten by the bear, but finally recovered. I have seen Bourasso, and can add that the account which he gives is fully credited by the traders resident in that part of the country, who are best qualified to judge of its truth from the knowledge of the parties. I have been told that there is a man now living in the neighbourhood of Edmonston House who was attacked by a grisly bear, which sprung out of a thicket, and with one stroke of its paw completely scalped him, laying bare the skull, and bringing the skin of the forehead down over the eyes. Assistance coming up, the bear made off without doing him further injury, but, the scalp not being replaced, the poor man has lost his sight, although he thinks that his eyes are uninjured. Mr. Drummond, in his excursions over the Rocky Mountains, had frequent opportunities of observing the manners of grisly

bears, and it often happened that in turning the point of a rock or sharp angle of a valley he came suddenly upon one or more of them. On such occasions they reared on their hind legs and made a loud noise like a person breathing quick, but much harsher. He kept his ground without attempting to molest them, and they on their part, after attentively regarding him for some time, generally wheeled round and galloped off; though, from their known disposition, there is little doubt he would have been torn in pieces had he lost his presence of mind and attempted to fly. When he discovered them from a distance, he generally frightened them away by beating on a large tin box in which he carried his specimens of plants. He never saw more than four together, and two of these he supposes to have been cubs; he more often met them singly or in pairs. He was only once attacked, and then by a female, for the purpose of allowing her cubs time to escape. His gun on this occasion missed fire, but he kept her at bay with the stock of it, until some gentlemen of the Hudson's Bay Company, with whom he was travelling at the time, came up and drove her off. In the latter end of June, 1826, he observed a male caressing a female, and soon afterwards they both came towards him, but whether accidentally, or for the purpose of attacking him, he was uncertain. He ascended a tree, and as the female drew near, fired at and mortally wounded her. She uttered a few loud screams, which threw the male into a furious rage, and he reared up against the trunk of the tree in which Mr. Drummond was seated, but never attempted to ascend it. The female, in the meanwhile retiring to a short distance, lay down, and as the male was proceeding to join her, Mr. Drummond shot him also. From the size of their teeth and claws, he judged them to be about forty years old. The cubs of the grisly bear can climb trees, but when the animal is fully grown it is unable to do so, as the Indians report, from the form of its claws. Two instances are related by Lewis and Clarke, and I have heard of several others, where a hunter having sought shelter in a tree from the pursuit of a grisly bear, has been held a close prisoner for many hours, by the infuriated animal keeping watch below." The flesh of the grisly bear is of very inferior quality; so much so, indeed, that the native Indians reject it, unless other food cannot be procured. Although these animals invariably hibernate during the winter months, the old males sometimes steal forth from their snug abodes to seek for food. The grisly bear has a pretty wide geographical distribution on the North American continent, extending from a latitude of upwards of sixty degrees north, to Mexico in the south. It is most abundant on the eastern slopes of the Rocky Mountains.

THE POLAR BEAR (*Thalarectos maritimus*), Plate 12, fig. 39.—This is the most carnivorous of all the bears, probably however, more by necessity than by choice. It is essentially a marine animal, destined to wander to and fro on blocks of ice, in dreary solitudes and wastes, seldom visited, save by the Esquimaux and a few of the more enterprising spirits of human kind. Here the polar bear makes havoc among seals, whales, walruses, and other denizens of

the polar seas. Dead or alive, nothing comes amiss, while his skill enables him to secure not only fish, but even birds. The general appearance of the polar bear is too well known to require a lengthened description; yet, it is necessary to notice a few of the principal characters. The body is more cylindrical than that of the land varieties of bear; the head is likewise rather more elongated; the ears are short. The muzzle is somewhat curved, the mouth being comparatively small, while the neck is long and thick. The fur, generally speaking, is white, long, loose, woolly in texture, and has a silvery lustre; on the legs and under the surface of the belly the hairs are much more lengthened. The claws are short, only slightly curved, and nearly concealed by the fur. The size attained by the polar bear is very considerable. Captain Lyons met with a specimen measuring rather more than eight and a half feet in length, and weighing sixteen hundred pounds avoirdupois. The same gentleman obtained from an intelligent Esquimaux the following account of the manner in which this animal hibernates:—"At the commencement of winter the pregnant bears are very fat and always solitary. When a heavy fall of snow sets in, the animal seeks some hollow place in which she can lie down, and remains quiet while the snow covers her. Sometimes she will wait until a quantity of snow has fallen, and then digs herself a cave; at all events, it seems necessary that she should be covered by, and lie amongst the snow. She now goes to sleep, and does not wake until the spring sun is pretty high, when she brings forth two cubs. The cave by this time has become much larger, by the effect of the animal's warmth and breath, so that the cubs have room enough to move, and they acquire considerable strength by continually sucking. The dam at length becomes so thin and weak, that it is with great difficulty that she extricates herself, when the sun is powerful enough to throw a strong glare through the snow which roofs the den." We have already alluded to this animal's cunning and activity. Here is the method it adopts to catch a seal, for the account of which we are also indebted to the "Private Journal" of Captain Lyon:—"The bear, on seeing his intended prey, gets quietly into the water, and swims to leeward of him, from whence, by frequent short dives, he silently makes his approaches, and so arranges his distance that, at the last dive, he comes to the spot where the seal is lying. If the poor animal attempts to escape by rolling into the water, he falls into the bear's clutches; if, on the contrary, he lies still, his destroyer makes a powerful spring, kills him on the ice, and devours him at leisure." Captain Sir Edward Belcher, in his interesting work entitled "The Last of the Arctic Voyages," also gives an amusing description of the performances of a female polar bear, whose antics seemed to have for their object the capture of a seal by another shrewd expedient. On the first day of June, 1853, he writes:—"We pushed on for Tongue Point, and there pitched. More bears! I was busy on the Point with the instrument, watching for an object, when I noticed a lady and her cub, amusing themselves, as I imagined, at a game of romps, but the old lady was evidently the more excited. Possibly no such

opportunity has before been afforded to any naturalist of witnessing quietly the humours or habits of these animals. At first the motions of the mother appeared to me as ridiculously absurd, or as if she was teaching her cub to perform a summerset, or something nearly approaching it; but the cub evinced no interest, no participation in the sport, indeed moved off and lay down, apparently to sleep. The antics, too, of the mother were too distant from the cub to prove instructive. I will endeavour to convey my impression of the exhibition, as viewed through the telescope at a distance of a quarter of a mile, as well as the object on which she appeared intent. It must first be borne in mind, that a bear of such dimensions as that before me would weigh about six and a half or seven hundred-weight. The object apparently in view was to break a hole in the ice. In order to effect this the claws were first put in requisition, and as nimbly and gracefully as a dog did the huge creature tear up and scatter snow and ice to the winds; having removed as she imagined sufficient, she then appeared to estimate her distance, calculate on her leap, and in the effort came down *perpendicularly* on her fore-paws over the spot which she had scratched. Something, she imagined, had been effected. She continued to repeat this scratching and amusing mode of pounding until at length she appeared satisfied, when she assumed an attitude of 'dead point,' with fore-paw raised, and remained for some time immovable. The question occurred to me, 'Is this a mode, by concussion and making a hole, of seducing a seal within gripe?' for I have repeatedly noticed that when we cut for tide-hole, fire-hole, &c., that these inquisitive animals will show themselves. This, however, I leave for others to verify." After this, an unsuccessful attempt was made to get within shot, but both mother and cub made their escape. Sir E. Belcher does not state whether he minutely examined the spot thus signalized, to ascertain if any injury had been done to the ice; nevertheless, his observations have very great interest, and the correctness of his conjecture is placed almost beyond a doubt. The female bear, as we have just seen, is very careful over her cubs; these, if taken while still very young, may be successfully tamed. The following incident, however, shows the necessity of caution:—An English officer, while stationed at one of the more remote and lonely fortresses of Canada, amused himself by taming a young polar bear. He succeeded in teaching the little cub to fetch and carry, and its behaviour was so unexceptionable that the animal was allowed to share his master's meals, and to follow at his heels when out for a walk. On returning to this country, the ursine pet accompanied the officer on board ship, and soon acquired the unreserved confidence of the passengers and crew, and by his facetious antics afforded them much pleasure and diversion. In a very short time, as is frequently the habit with domesticated animals, he showed a particular liking for children of the female sex, and singled one out as an especial favourite; the little girl, who was a daughter of one of the lady passengers, reciprocated the bear's attentions, and the loving pair daily romped about the deck with ecstasie delight. This fun, however, was after a time destined

to be suddenly changed into sorrow, for on one occasion during their gambols, the animal, without giving any previous indication of his purpose, suddenly seized the young lady by the waist, and before the astonished crew and half-distracted parent could do aught to arrest his progress he was half way up the rigging; neither did he rest till he had gained the maintop! Doubtless, many of our readers have heard of an elopement *down*, but, perhaps, never *up* a ladder of ropes! But the matter is too serious for a joke! What is to be done? The mother cries!—the child screams!—and the bear recommences its antics! A moment's delay may render all chance of escape hopeless! Alarm and consternation fill every breast! Shall the sailors ascend the rigging, and by united force tear the frail captive from its arms? If the bear should at any moment relinquish its hold, the poor child must be dashed in pieces! Bravo!—a bright idea has struck the captain! See with what alacrity his orders are obeyed! Mattresses and pillows are placed around the mast, in case the child should fall, while numerous lumps of sugar are piled together on the deck! Hurrah! the saccharine dainty cannot be resisted! Down comes Bruin, carefully bringing the captive with him! Once more, hurrah! Mother and bear are satisfied! The child is released—the sugar devoured! It is almost needless to add, that during the rest of the voyage, the animal was entirely deprived of his sadly-abused liberty. In regard to the capture and destruction of full-grown polar bears in the wild state, early writers have always described such attempts as extremely dangerous; these accounts have probably been exaggerated, but there can be no doubt that in recent times the danger has been materially lessened by the introduction of longer-ranged and more destructive fire-arms. The polar bear seldom quits the regions of eternal ice and snow; nevertheless he is sometimes observed drifting out to sea on floating icebergs; by this means he makes excursions to very considerable distances, and has been observed by Captain Scoresby upwards of two hundred miles from the shore. As many as a dozen have come over from West Greenland and landed on the coast of Iceland during a single winter season. Captain Parry, when passing through Barrow's Strait, encountered a polar bear swimming vigorously in the open sea, although at the time the animal was fully forty miles from any coast, and there were no traces of floating ice in any direction. Specimens of this animal have always constituted an attractive feature in our menageries, and, notwithstanding the unsuitable character of this climate, they seem to live pretty comfortably. A few years since one of the very fine specimens kept in the Zoological Gardens at Edinburgh gave birth to a solitary cub, but it very soon perished.

FAMILY II.—MUSTELIDÆ.

Not only are the weasels, properly so called, placed under this head, but also numerous genera, whose relations are so closely allied to the foregoing family that they are grouped by some naturalists with the Ursidæ, and by others with the present family. On this point

we purposely adhere to the Cuvierian arrangement, as far as circumstances permit. The Mustelidæ, as we have retained the genus, are either semi-plantigrade or to a greater or less extent digitigrade—that is to say, they are supported on the tips of their toes during progression. The feet are five-toed or pentadactylous, the claws being fixed or non-retractile. They have elongated, slim, and cylindriacal bodies; it is on account of this long vermiform or worm-like character that the majority of them are called vermin, though to the popular mind that term rather expresses the idea of certain noxious qualities, altogether independent of its etymological signification. The limbs of Mustelidæ are short. The head is rounded and narrowed anteriorly, but that part of the skull containing the brain is considerably extended; so that the space between the sockets and the posterior margin of the cranium, is much greater than that which obtains in the higher digitigrade Carnivora. The jaws support the usual complement of twelve incisors and four canines, whilst there are generally four or five molars on either side belonging to the upper series, and five or six similarly disposed in each division of the lower group. Four of these teeth are tuberculated—that is, one to each of the four divisions of the grinding series above indicated. The condyles or articulating extremities of the rami of the lower jaw are broad transversely, and completely lodged in the corresponding socket called the glenoid cavity. The Mustelidæ, like the bears, have no blind or cæcal appendage to the intestine. They do not pass the winter in a state of hybernation. Their destructive and sanguinary propensities are well known; and members of the family are found in all quarters of the globe. Musteline fossil remains occur in the bone-caves and osseous breccias of the tertiary period.

THE JAVANESE TELEDU (*Mydaus meliceps*).—Purposely commencing our weasels with this aberrant type, more particularly on account of its close relations to certain ursine and insectivorous genera, we remark, in the first place, that the muzzle is prolonged in the form of a proboscis. The grinding teeth are eighteen in number, there being twelve spurious and six true ones. The laniary, cutting, or carnassial tooth—that is, the fourth or last premolar tooth, reckoning from before backwards—supports an accessory central cusp. The head is hog-like; the ears being rudimentary, and surrounded by a tuft of long fur. The fur consists of delicate hairs, which are more or less blackish-brown throughout, except on the central line of the back, on the top of the head, and at the end of the tail, which latter is only half an inch in length, not taking into consideration the long hairs projecting beyond the skin. The body measures about fifteen inches. The limbs are short, thick, and semi-plantigrade, the compressed and rather straight claws being united at the base by a sheathing membrane. The teledu emits a most horrible odour, as the author of this article can abundantly confirm, from having had a specimen placed in his hands for dissection and preservation. The intolerable stench arises from the secretion of a peculiar matter by two oval glands situated at the posterior part of the body, and opening into the intestine near

the vent. The animal has the power of ejecting this secretion to a distance of about two feet. "The fetid matter itself is of a viscid nature; its effects depend on its great volatility, and they spread through a great extent; the entire neighbourhood of a village is infected by the odour of an irritated teledu, and in the immediate vicinity of the discharge it is so violent as in some persons to produce syncope." Dr. Horsfield gives the following admirable account of its habits and singular geographical distribution:—"The teledu is confined exclusively to those mountains which have an elevation of more than seven thousand feet above the level of the ocean; on these it occurs with the same regularity as many plants. The long-extended surface of Java, abounding with conical points which exceed this elevation, afford many places favourable for its resort. On ascending these mountains, the traveller scarcely fails to meet with our animal, which, from its peculiarities, is universally known to the inhabitants of these elevated tracts; while to those of the plains, it is as strange as an animal from a foreign country. A traveller would inquire in vain for the teledu at Batavia, Semarang, or Surabaya. In my visits to the mountainous districts, I uniformly met with it; and, as far as the information of the natives can be relied on, it is found on all the mountains.

. . . Most of these mountains and ridges furnish tracts of considerable extent fitted for the cultivation of wheat and other European grains. . . . These grounds and plantations are laid out in the deep vegetable mould, where the teledu holds its range as the most ancient inhabitant of the soil. In its rambles in search of food, this animal frequently enters the plantations, and destroys the roots of young plants; in this manner it causes extensive injury, and on the Tengger Hills particularly, where these plantations are more extensive than in other elevated tracts, its visits are much dreaded by the inhabitants. It burrows in the earth with its nose in the same manner as hogs, and in traversing the hills its nocturnal toils are observed in the morning in small ridges of mould recently turned up. The mydaus forms its dwelling at a slight depth beneath the surface, in the black mould, with considerable ingenuity. Having selected a spot, defended above by the roots of a large tree, it constructs a cell or chamber of a globular form, having a diameter of several feet, the sides of which it makes perfectly smooth and regular; this it provides with a subterraneous conduit or avenue about six feet in length, the external entrance to which it conceals with twigs and dry leaves. During the day it remains concealed, like a badger in its hole; at night it proceeds in search of its food, which consists of insects and their larvæ, and of worms of every kind. It is particularly fond of the lumbrici, or earthworms, which abound in the fertile moulds. These animals, agreeably to the information of the natives, live in pairs, and the female produces two or three young at a birth. The motions of the mydaus are slow, and it is easily taken by the natives, who by no means fear it. During my abode on the mountain Prahu, I engaged them to procure me individuals for preparation; and, as they received a desirable reward, they brought them to me daily in greater

numbers than I could employ. Whenever the natives surprise them suddenly, they prepare them for food; the flesh is then scarcely impregnated with the offensive odour, and is described as very delicate. The animals are generally in excellent condition, as their food abounds in the fertile moulds. . . . The mydaus is not ferocious in its manners; and taken young, like the badger, it might be easily tamed. An individual which I kept some time in confinement afforded me an opportunity of observing its disposition; it soon became gentle and reconciled to its situation, and did not at any time emit the offensive fluid. I carried it with me from Mountain Prahu to Blederan, a village on the declivity of that mountain where the temperature was more moderate. While a drawing was made, the animal was tied to a small stake; it moved about quietly, burrowing the ground with its snout and feet, as if in search of food, without taking notice of the bystanders, or making violent efforts to disengage itself. On earthworms being brought, it ate voraciously; holding one extremity of a worm with its claws, its teeth were employed in tearing the other. Having consumed about ten or twelve, it became drowsy, and making a small groove in the earth, in which it placed its snout, it composed itself deliberately, and was soon sound asleep."

THE NYENTEK (*Helictis moschatus*) is a rarer animal than the teledu, and more circumscribed in its geographical area of distribution. It is about sixteen inches in length, not including the tail, which measures six inches more; this organ is bushy, terminating in long thick hairs. The head is small, gradually narrowing into an obtusely-pointed muzzle. The jaws are furnished with twenty-two molars, the tuberculated pair above being small and widened transversely. The nostrils are notched at the side. The moustaches are few in number, long, and bristly. The ears are comparatively large; the eyes being rather prominent. The limbs are thin, terminating in five-toed plantigrade feet. The claws are shorter than those of the teledu, and are more strongly curved. This animal, says Dr. Horsfield, who described it as a species of *Gulo*, "is somewhat smaller than the English pole-cat. The form of its body, in comparison with other gluttons, is rather slender; it is thickly covered with fur, consisting of long hairs closely arranged, silky at the base, of a brown colour and somewhat glossy, with a slight tint of reddish-brown; in certain lights it appears diversified, greyish, and tawny. This fur covers the greatest part of the body and head, and the whole of the tail and extremities; the colour of these parts is consequently brown, with occasional shades of rufous and tawny; the sides of the head, the neck, the throat, breast, and a broad spot on the top of the head, which passes, gradually decreasing in breadth, to the middle of the back, are white, with an obscure tint of isabella yellow of different degrees of intensity. This colour also exists, less distinct, in a longitudinal band along the lowest part of the abdomen." Little or nothing is known of this animal's habits, which are thought by Dr. Horsfield to be similar to those of the ratel.

THE SKUNK (*Mephitis americana*), Plate 10, fig. 33.—Various species of skunk have been described,

but most of them appear referable to this species. The true skunks are confined to the American continent. Accepting Sir John Richardson's description, the skunk very closely resembles the wolverene. The body is stoutish, and stands low; the eyes being small, and the ears short and rounded. "A narrow white mesial line runs from the tip of the nose to the occiput, where it dilates into a broad white mark. It is again narrowed, and continues so until it passes the shoulders, when it forks, the branches running along the sides, and becoming much broader as they recede from each other. They approach posteriorly and unite on the rump, becoming at the same time narrower. In some few specimens the white stripes do not unite behind, but disappear on the flanks. The black dorsal space included by the stripes is egg-shaped, the narrow end of which is towards the shoulders. The sides of the head and all the under parts are black. The hair on the body is long. The tail is covered with very long hairs, and has generally two broad longitudinal white stripes above on a black ground. Sometimes the black and white colours of the tail are regularly mixed. Its under surface is black. The claws on the fore-feet are very strong and long, being fitted for digging, and very unlike those of the martens." The jaws are provided with eighteen molar teeth, the upper lanuary grinder being remarkably large. Respecting the habits of the skunk, which has obtained such notoriety on account of the nauseating smell emitted from the glands previously alluded to, the same distinguished naturalist writes:—"It exists in the rocky and woody parts of the country, but is still more frequent in the clumps of wood which sketch the sandy plains of Seskatchewan. I have not been able to ascertain the southern range of this variety of skunk [from Hudson's Bay]; and, judging from Kahn's description, there appears to be a different one in Canada. The skunk passes its winter in a hole, seldom stirring abroad, and then only for a short distance. It preys on mice, and in summer has been observed to feed much on frogs. It has a slow gait, and can be overtaken without difficulty, for it makes but a poor attempt to escape, putting its trust apparently in its power of discomfiting its pursuers by the discharge of a noisome fluid. This fluid, which is of a deep yellow colour, and is contained in a small bag placed at the root of the tail, emits one of the most powerful stench in nature, and so durable that the spot where a skunk has been killed will retain the taint for many days. Mr. Graham says that he knew several Indians who lost their eyesight in consequence of inflammation produced by this fluid having been thrown into them by the animal, which has the power of ejecting it to a distance of upwards of four feet. I have known a dead skunk thrown over the stockades of a trading port, which produced instant nausea in several women, in a house with closed doors upwards of a hundred yards distant. The odour had some resemblance to that of garlic, although much more disagreeable. One may, however, soon become familiarized with it; for, notwithstanding the disgust it produces at first, I have managed to skin a couple of recent specimens by recurring to the task at intervals. When care is taken not to soil the carcase with any of

the strong smelling fluid, the meat is considered by the natives to be excellent food." These observations agree for the most part with those of Catesby, who says:—"When one of them is attacked by a dog, to appear formidable it so changes its usual form, by bristling up its hairs and contracting its length into a round form, that it makes a very terrible appearance. This menacing behaviour, however insufficient to deter its enemy, is seconded by a repulse far more prevailing; for from some secret duct it emits such fetid effluvia that the atmosphere, for a large space around, shall be so infected with it that men and other animals are impatient till they are quit of it. The stench is insupportable to some dogs, and necessitates them to let their game escape; others, by thrusting their noses into the earth, renew their attacks till they have killed it; but rarely care to have more to do with such noisome game, which for four or five hours distracts them. The Indians, notwithstanding, esteem their flesh a dainty, of which I have eaten and found it well tasted. I have known them brought up young, made domestic, and prove tame and very active, without exercising that faculty which fear and self-preservation perhaps only prompt them to." Like its congeners, the skunk does not entirely confine itself to an animal diet, vegetable matters, especially fruit, being sought in the absence of small quadrupeds, frogs, and insects. The female produces from six to ten young at a birth. In the Catalogue of Mammalia preserved in the British Museum, this species is called by Dr. Gray *Mephitis varians*.

THE GRISON (*Galictis vittata*).—The members of the genus *Galictis* originally established by Mr. Bell, are characterized by the possession of eighteen molar teeth, of which ten are spurious, four of them belonging to the upper series and six to the lower. The body is much elongated, terminating in sub-plantigrade pentadactylous feet, their palms and soles being naked. The tail is of moderate length. In the species under consideration "the colours are very remarkable, and the markings distinct and decided (fig. 23). The whole of the upper part of the head, the neck, the back, the flank, and the tail, are yellowish-light or brownish-grey, produced by the mixture of a dirty yellowish-white with brownish-black for about two-thirds of their length; the tip, dirty or yellowish-white. The muzzle, the cheeks, the throat, the under part of the neck, the belly, the anterior legs, and the hinder feet, are black, with a brownish tinge lighter towards the back part, and on the belly interspersed with a few whitish hairs. The grey of the upper, and the black of the under parts, are separated by a rather broad fascia (or band), extending on each side from the centre of the forehead above the eye, backwards as far as the shoulder, including the ears; this fascia is of a buff or yellowish-white colour." Respecting its habits, Mr. Bell also records the following interesting particulars. In his "History of British Quadrupeds," he says:—"A tame grison (*Galictis vittata*) which I possessed for several years, was very fond of frogs, but these were not the only reptiles which were obnoxious to its voracity. On one occasion, in the winter, I had placed it in its cage, in a room with a fire, where I had also two young

alligators, which in general were stupidly tame. On going into the room in the morning, I found the grison at large, and one of the alligators dead, with a hole eaten under the fore-leg, where the great nerves and bloodvessels were torn through; and the other alligator began snapping furiously at every one who attempted to approach it." The same eminent naturalist elsewhere remarks that this grison "was as tame and

affectionate as a dog; and she followed me," he adds, "wherever I went about the house, was extremely frolicsome and playful, and was delighted at being caressed. She would throw herself on her back, and seize the hand that fondled her with all four of her paws and her mouth at the same moment, pressing it with her teeth, but never sufficiently hard to cause the slightest degree of pain. She was extremely fond of

Fig. 23.

The Grison (*Galictis vittata*)

eggs, which she ate in a very singular manner. On one being given her, she first played with it for some time, running backwards and at the same time pushing it under her belly with her fore-feet. At length she would fix one of her sharp canine teeth through the shell, and lick or suck as much of the contents as would flow through the orifice. Then, again inserting her tooth, a piece of the shell was broken out so as to enable her to insert her tongue; and, finally, the egg-shell was broken to pieces and each fragment carefully licked clean." The grison is an inhabitant of the northern regions of Brazil, the specimens hitherto seen in this country having been brought from Guiana and Paraguay. A brief, but very accurate description of a fine example captured by Mr. Edmonston at Demerara, is described by Dr. Traill in the third volume of the Wernerian Society's Transactions. It measured nearly three feet in length, including the tail which gave nine inches. In the list of Mustelidæ preserved in the British Museum, this species is denominated *Grissonia vittata*.

ALLAMAND'S GRISON (*Galictis Allamandi*), appears to be a well-marked form. Mr. Bell has given a beautiful figure of it, accompanied with another of the above, in the second volume of the Transactions of the Zoological Society. According to his description, "this species, though evidently distinct from the former, exhibits the same general character of colour and marking, with some remarkable differences, however, which, though not easily expressed in a specific phrase, are tangible and important. The whole of those parts

which in the former species are yellowish, are here perfectly white; and those which are blackish-brown in the former, are in this pure black. The basal portion of the hairs on the back, therefore, is black, and the apical quite white, forming a pure blackish-grey or black, with white points and lines, whilst all the under parts of the throat and part of the belly are black. The fascia extending from the forehead to the sides of the neck is also white. This fascia does not extend in the specimen described so far back as in the former species. The hairs of the whole body are very short in comparison, and much stiffer and more closely set. The animal is considerably larger, and the tail, as far as can be ascertained from a stuffed specimen, short in proportion." As in the foregoing, its habits correspond with those of the weasels generally.

THE ZORILLA (*Zorilla striata*).—Several forms described under the generic title of Zorilla, are probably merely varieties of one and the same species. Perhaps two or three of them may fairly be regarded as distinct. Their differentiation obtains chiefly in respect of colour and other superficial characters, which, however, are in too many instances the only distinctions the zoologist can rely on, as he may have none other to guide him. The zorilla, known to the colonists at the Cape of Good Hope by the name of *muishond*, possesses eighteen molar teeth, four being placed on either side above, and five correspondingly opposed on each side below. The prepared skeleton exhibits five vertebral segments in the lumbar region of the spine, while there are no less than fifteen pair of ribs. The fur is of a

black colour generally; but there are four whitish bands, which, commencing at the neck, pass in a backward direction, gradually diverging from one another. This character has suggested the specific name above given. There is also a white spot on the upper part of the head. The zorilla is not confined to the Cape of Mozambique, but is still found in Nubia, Abyssinia, and other parts of the African continent. Its habits are similar to those of the skunk. It is also known under the title of *Mephitis africana*.

THE SABLE (*Martes leucopus*).—The various members of the genus *Martes*, differ from the true weasels generally, by the possession of "an additional false molar above and below," whilst they have also a small tubercle on the inner side of their sectorial tooth. These two characters tend to diminish the ferocity of their nature; or, rather, they indicate by analogical and correlative evidence, that such a subcarnivorous disposition exists in accordance with their modified dental arrangements. Their habits and general appearance entirely correspond with these structural peculiarities. They are pretty and attractive little animals, having large bushy tails. The martens have larger ears than the weasels, and their habits are more arboreal, while the odour emitted by them is not offensive. Much controversy has arisen as to the specific distinctions of various kinds of marten. Thus, by some the sable, the pine marten, and the beech marten have been considered as mere varieties of a single species; that is to say, they are supposed to have originated from the same stock, and that stock, in all probability, being represented by a single pair. This view, however, does not appear tenable, and after lengthened investigation, the more general opinion now received is, that they are different animals *ab origine*. The sable is celebrated for its beautiful fur, which is of a yellowish-brown colour, inclining to black. The throat is pale yellow; but it varies somewhat in different individuals. We have here placed the sable as a distinct species, in accordance with the opinion of some of our highest authorities.

THE PINE MARTEN (*Martes abietum*).—Plate 10, fig. 34—if not specifically identical, very closely resembles the foregoing. The fur is of a comparatively inferior quality; yet it is much superior to that of the beech or stone marten. It exists in northern Europe and North America, being also indigenous in our own country. According to Sir John Richardson's description, "the pine marten inhabits the woody districts in the northern parts of America, from the Atlantic to the Pacific, in great numbers, and has been observed to be particularly abundant where the trees have been killed by fire, but are still standing. It is very rare, as Hearne has remarked, in the district lying north of Churchill River and east of Great Slave Lake, known by the name of Chepewyan or Barren Lands. A similar district on the Asiatic side of Behring's Straits, twenty-five degrees of longitude in breadth, and inhabited by the Tchutski, is described by Pennant as equally unfrequented by the marten, and for the same reason—the want of trees. The limit of its northern range in America is, like that of the woods, about the sixty-eighth degree of latitude, and it is said to be

found as far south as New England. Particular races of martens, distinguished by the fineness and dark colour of their fur, appear to inhabit certain rocky districts. The rocky and mountainous, but woody districts of the Nipigon, on the north side of Lake Superior, has long been noted for its black and valuable marten skins. The marten preys on mice, hares, and partridges, and in summer on small birds' eggs, &c. A partridge's head with the feathers, is the best bait for the log traps in which this animal is taken. It does not reject carrion, and often destroys the hoards of meat and fish laid up by the natives, when they have accidentally left a crevice by which it can enter. The marten, when its retreat is cut off, shows its teeth, sets up its hair, arches its back, and makes a hissing noise, like a cat. It will seize a dog by the nose, and bite so hard, that unless the latter is accustomed to the combat, it suffers the little animal to escape. It may be easily tamed, and it soon acquires an attachment to its master; but it never becomes docile. Its flesh is occasionally eaten, though it is not prized by the Indians. The females are smaller than the males. They burrow in the ground, carry their young about six weeks, and bring forth from four to seven in a litter about the latter end of April." The dark-coloured furs are deemed the most valuable, and they are in the best condition during the winter season. Respecting the distinctions observable between this species and the beech marten, Mr. Bell observes, that "the most striking and obvious differences are those of colour; but as these appear, in some cases at least, to be associated with certain slight diversities in size and proportion, and as the habits of the two animals also offer a trifling variation, there appears to be some, though far from satisfactory ground, for considering them as specifically distinct. The pine marten is so called from its supposed preference for the fruits of those trees, as the other is called by some the beech marten, from a similar pretended preference for beech woods. There is, however, no ground for this appropriation of the two species to these different localities." The nest is made of moss, leaves, and other vegetable matters. A full-grown individual of the male sex measures about twenty inches, the females being rather smaller.

THE BEECH MARTEN (*Martes foina*), is also called the common marten, and by traders it is more usually designated the stone marten. Its fur is inferior to that of the preceding species, and it is sometimes passed off unfairly for the skin of the true sable. An experienced eye, however, readily detects the fraud, noticing the absence of lustre, softness, and other essential qualities. The beech marten is about eighteen inches long, not including the tail, which alone measures upwards of nine inches. The head is rounded and broad posteriorly, narrowing in front into an acute and slightly projecting muzzle. The ears are comparatively large, oval, and a little pointed. The body is thin, cylindrical, and very mobile, terminating in a thick bushy tail. The fur is for the most part brown, being darker in some parts than in others. It is deeper-coloured on the back, limbs, and tail. On the throat or under part of the neck it is white. The beech marten is a

native of the British isles, as well as of Europe generally. It occurs abundantly in rocky mountainous districts, and is perhaps less strictly arboreal in its habits than the pine marten. According to Mr. Bell, "the female makes her nest generally in a hollow tree, but not unfrequently in holes in rocks, sometimes in ruined buildings, or even in granaries and barns. It is formed of straw or grass. She has at least two litters in a year—some assert, four—and the number of young ones at each birth varies from two to seven, the usual number being four or five. The aspect and attitudes of the marten are perhaps more elegant than those of any other of our native quadrupeds. Endowed with great liveliness and activity, its movements are at once rapid and gracile. Its limbs are elastic, and its body lithe and flexible, and it bounds and springs over the ground with equal speed and grace. It is, however, wild and untameable to a great degree, if captured when full grown or after a very early age." The food of the beech marten, in common with its allied forms, consists of birds, squirrels, and other small quadrupeds.

THE PEKAN (*Martes Canadensis*) of the Canadians, is known by the title of the Fisher or fishing marten, and it has likewise several other names. It presents a more canine look about the face than the sable or other martens. The head is rounded posteriorly, contracting suddenly in front to terminate in a rather sharply-pointed muzzle. The ears are comparatively small. It is a stouter-built animal than the pine marten. The fore-limbs are remarkably strong and short, the claws of the feet being sharp and much curved. As in the pine marten, the soles of the feet are completely enveloped in closely-set hairs, the several digits being connected together at their common base by a short, web-like expansion of the skin. The fur is rather coarse, and of a dark-brown colour, lighter at the fore part of the body, but almost black behind, as well as on the throat, belly, and limbs. White-spots are occasionally seen between the fore and hind legs. The fur has a strong musky odour, and its quality is inferior to that of the sable. Although less sought after by the American fur-dealers, several thousand pekans are destroyed annually for the sake of their skins. Sir John Richardson states that it feeds principally on mice. He adds—"It lives in the woods, preferring damp places in the vicinity of water, in which respect it differs from the marten, which is generally found in the driest spots of the pine forests. The fisher is said to prey much on frogs in the summer season; but I have been informed that its favourite food is the Canada porcupine, which it kills by biting on the belly. It does not seek its food in the water, although, like the pine marten, it will feed on the hoards of frozen fish laid up by the residents." The pekan is widely distributed over the upper half of the North American continent. The female produces from two to four young at a single litter.

THE POLECAT (*Mustela putorius*) or *foumart* is a most ferocious creature (fig. 24). "Its appetite for slaughter, which seems never to be satiated as long as

Fig. 24.

The Polecat (*Mustela putorius*).

any living thing remains within its reach, rendering it a most ruinous neighbour to those who rear fowls or keep up a head of game. Not only the young birds fall victims to it, but the parents also; nor are even geese or turkeys safe. We remember an instance of a hen and a whole brood of chickens being killed by one of these destroyers in a single night; and upon another occasion, seven or eight nearly full-grown turkeys. The brain and the blood seem to be its choicest portions. The bodies of the dead are carried off to its haunts, which are generally in some copse or wood near a farm or in the heart of a preserve, whence it issues on its deadly errand in the evening, generally soon after sunset, or when it grows dusk. No vermin is placed with more satisfaction upon the keeper's tree; for none commits more havoc, if so much, among the game. Beginning with the egg, it persecutes all the game birds through every period of life, and is a far more determined enemy than the stoat itself to the hare and rabbit warren. The fox, as is well known, will do much to keep down the pheasants, and especially the rabbits and hares; but even this wily and powerful invader is not so mischievous as the species of which we are treating. Where a fox will kill one, a polecat will immolate ten, to say nothing of eggs. No vertebrated animal seems to come amiss to its murderous nature. Bewick relates that during a severe storm, a foumart was traced in the snow from the side of a rivulet to its hole at some distance from it. As it was observed to have made frequent trips, and as other marks were to be seen in the snow which could not easily be accounted for, it was thought a matter worthy of great attention. Its hole was accordingly examined, and five fine eels were discovered to be the fruit of its nocturnal excursions. The marks in the snow were made by the motion of the eels in the quadruped's mouth. In *Loudon's Magazine* is an account of a polecat that was hunted to her nest, which held five young ones in a comfortable bed of withered grass. From a side hole the narrator picked out forty large frogs and two toads alive, but capable of sprawling only; for the old polecat had stricken them all with palsy by a bite through the brain of

each." Such is Mr. Ogilby's account of its depredations; and there are few of us who have resided in the country that cannot testify to its accuracy. The polecat is a larger and stouter-built animal than the marten. Its body rather exceeds two feet in length, not including the tail, which measures only six inches. The head and neck are comparatively stout and thick. The fur is of a dark-brown colour, approaching black. There is, however, a considerable difference of shade, depending upon the greater or less abundance of short woolly hairs, having a pale brown colour. The lips and cheeks are more or less whitish. The odour given out by the polecat has a very disagreeable smell. It is produced by a fatty substance secreted by a gland situated beneath the tail. The fur, though of comparatively small value, is sold under the name of fitch; hence the term fitchet weasel, another name by which this animal is known. The female produces towards the close of the spring, or in early summer, a litter of five or six young. The nest is made either in a rabbit burrow or in some similar snug retreat, among stones and rocks covered over with long grass, tangled herbage, or low brushwood.

The common ferret is considered by most naturalists to be a mere domesticated variety of the polecat. It exhibits every shade of hue from that of a pale yellowish-white up to a dark fulvous brown, and it is most frequently somewhat variegated. Its habits are similar to those of the wild animal, and they will freely breed together. The ferret, however, can hardly be considered a tame creature, in the strict meaning of the term; for, as most of us have observed, its disposition is exceedingly capricious, and in handling ferrets, as every rat-catcher knows, a certain degree of boldness and caution are necessary. The following sad story, taken from Mr. Jesse's "Gleanings in Natural History," illustrates its truly carnivorous and sanguivorous propensities. "Some few years ago, a poor woman, holding a mangled infant in her arms, rushed screaming with agony and fright into my friend's house, who is a surgeon, imploring him to save the child's life, who, she said, had been almost killed by a ferret. The face, neck, and arms were dreadfully lacerated, the jugular vein had been opened, as also the temporal artery. The eyes were greatly injured, and indeed the child, who is still living, has lost the entire sight of one of them, and has very imperfect vision in the other. Having stopped the still bleeding vessels, my friend accompanied the mother to her cottage, on entering which the child, in some degree recovering from its state of apparent death, began to cry, when the ferret was in an instant seen rushing from behind some basins where he had taken shelter, and with his head erect, boldly came forward and met the infuriated parent in the middle of the room, still holding the infant in her arms. On my friend's kicking the ferret, as the first impulse of protection, the animal endeavoured to seize his leg, and not until his (the ferret's) back was broken by repeated kicks, did he give over his earnest and reiterated attempts to renew his sanguinary feast; and indeed, whilst in the agonies of death, the piteous screams of the child seemed to rouse him to vain efforts to regain his prey.

The ferret was of large growth and much distended with the infant's blood; and though formerly of peculiar shyness, yet he lost sight of fear and became bold in the pursuit of the unfortunate infant. It appears the poor woman had left her child (about six months old) in a cradle, whilst she went to market, when it is supposed the infant's cry had arrested the attention of the ferret, who managed to make his escape, and thus effected his purpose. There is good reason to believe he must have passed more than half an hour in the indulgence of his appetite, from the circumstance of the neighbours having heard the piercing shrieks of the child a long time without the slightest suspicion of the mother's absence." Finally, we have only to remark, that the method of employing ferrets for the capture of rabbits, rats, and other vermin is too well known to require more than a passing allusion. In the majority of cases it is advisable to use a muzzle; otherwise the ferret is very apt, after having feasted on its prey, to lay up in the burrow, and disappoint the sportsman. This remark applies more particularly in the case of rabbit hunting.

THE ERMINE OR STOAT (*Mustela erminea*) is a much smaller species. The body is scarcely ten inches long, exclusive of the tail; this organ is four and a half inches in length, slightly bushy towards the tip, the hairs of which are invariably black. In the summer the fur is rufous-brown on the back, and white underneath from the chin to the root of the tail. In the winter the entire fur becomes white, with the exception of the tail; and this change is brought about, not by an alteration of the colour of the summer hairs, as some have supposed, but by the development of new and white hairs in the autumn to supply the place of the falling coloured ones. It is this metamorphosis of the fur which renders the ermine so valuable in commerce. From the North of Europe and Siberia several hundred thousand skins are exported annually to various parts of the world—a large proportion of them being transmitted to this country. Every one is familiar with the pure, white, glossy texture of ermine tippets, boas, and other robes, whose pure snow-white ground-work is beset and adorned with a regularly-disposed series of quincunxially-arranged tails, forming a striking contrast by their rich jet-black colour. Such are the leading characteristics of the fur. With regard to this animal's habits, Mr. Bell observes that they vary "from those of the weasel, principally with relation to the difference of size. Although much more destructive than that animal to poultry and to game, the favourite object of its pursuit is the common rat and the water-vole, as that of the weasel is the different species of mice. Prevented from following the latter little pests into their runs, which are often not much larger than their own bodies, the stoat leaves such small game to its little congener, and betakes itself to prey more suited to its own bulk. It occasionally attacks hares even half or two-thirds grown, pursuing them with the utmost pertinacity, and hunting them down by dint of its indefatigable perseverance. The Rev. F. W. Hope informs me, that on one occasion, when shooting in Shropshire, he heard at a short distance the shrill loud scream of a hare, which he

concluded was just caught in a poacher's springe. On running towards the spot from whence the sound proceeded, he saw a hare limping off greatly distressed, with something attached to the side of the throat, which a nearer approach showed to be a stoat. The hare made its way into the brushwood with its enemy still clinging on. It is a curious fact, that the hare, when pursued by the stoat, does not betake itself to its natural means of escape—its fleetness of foot—which would in a few seconds carry it out of all danger from its little enemy, and which it always employs when escaping from the chase of dogs or of the fox. On the contrary, it hops languidly along, evidently aware of the stoat's approach, yet as if incapable of exerting its powers to avoid the impending destruction. Whether this arises from a stupid indifference, or from not appreciating its danger, or, on the other hand, from intense terror, producing an effect similar to that mis-called fascination, which the small bright eye of the rattlesnake excites in its helpless victims, it is perhaps difficult to decide. The stoat is certainly one of the boldest animals of its size. It pursues its prey with the greatest intrepidity even into circumstances of considerable danger, and, like the weasel, will follow it into the water. It will also cross the water for the purpose of besieging the haunts of the water-vole, *Arvicola amphibius*, of which it destroys great numbers. In swimming it lifts the head and neck well out of the water, like a dog. It hunts its prey by scent." The ermine is comparatively scarcer than the weasel in England; but in Scotland, as Mr. Macgillivray remarks, "it is certainly of more frequent occurrence than that species; and for one weasel, I have seen at least five or six ermines. It frequents stony places and thickets, among which it finds a secure retreat, as its agility enables it to outstrip even a dog in a short race, and the slimness of its body allows it to enter a very small aperture. Patches of furze in particular afford it perfect security, and it sometimes takes possession of a rabbit's burrow. With regard to this little animal's boldness and ferocity of disposition, we have not only the testimony of the gentlemen above named, but that of many others, including Sir John Richardson and Captain Lyon. The author of the section of this work at present under consideration, can also testify to its combativeness, having once been imprudent enough to attempt the capture of a specimen without any weapon. The little beast immediately fastened itself on his armsleeve, but was fortunately dislodged by a violent jerk before its teeth had done more than graze the skin. On falling to the ground it scampered off to the nearest hedgebank, and was soon out of sight. The ermine is usually caught by very simple means, namely, by a trap in the form of a heavy stone or slab, which, being delicately supported by a thin stick baited with flesh, at the first or second nibble suddenly falls and crushes the intruder. Sentimental individuals may be disposed to pity the poor little ermines, who are thus mercilessly destroyed to serve for the external adornment of the wealthy; but we beg to remind such persons that it were better, without warning, to perish like a stoat beneath the squash of a brickbat, than to sit round a well-served table with a Damoclesian sword suspended over one's

head. In respect of geographical distribution, the ermine is not confined to the eastern hemisphere; for it is also found abundant in North America. It is, however, not much sought after by the furriers of the Hudson's Bay Company, on account of the large supply imported into Britain from Russia and the north of Europe, which renders it too cheap for a profitable competition. In England the female is said to produce only four or five young at a single birth; but, according to the Canadian aborigines, it produces in America ten or twelve at a litter. The nest is made of grass, leaves, and other vegetable matters, and is placed in a rat-hole or other forsaken burrow.

THE WEASEL (*Mustela vulgaris*).—Having dwelt at considerable length on the character and habits of the stoat, which is so closely related to the present species, our observations respecting the weasel will be necessarily more restricted. It is a smaller animal, the body being about eight and a quarter inches in length, not including the tail, which would give us at least another two inches. The fur is of a reddish-brown colour on the back, head, and tail; but underneath the belly and throat it is quite white. The limbs are short and hairy up to the extremities of the digits. As we have before remarked, its habits are very similar to those of the stoat; but, although generally regarded as a highly noxious animal under some circumstances, would appear to be extremely useful. Mr. Bell, with his usual tact in defending the persecuted of animal kind, thus advocates its cause:—"It is not meant to be asserted that the weasel will not, when driven by hunger, boldly attack the stock of the poultry-yard, or occasionally make free with a young rabbit or a sleeping partridge; but that its usual prey is of a much more ignoble character, is proved by daily observation. Mice of every description, the field and the water-vole, rats, moles, and small birds, are its ordinary food; and from the report of unprejudiced observers, it would appear that this pretty animal ought rather to be fostered as a destroyer of vermin, than extirpated as a noxious depredator. Above all, it should not be molested in barns, ricks, or granaries, in which situations it is of great service in destroying the colonies of mice which infest them. Those only who have witnessed the multitudinous numbers in which these little pests are found, in wheat ricks especially, and have seen the manner in which the interior is sometimes drilled, as it were, in every direction by their runs, can at all appreciate the amount of their depredations; and surely the occasional abduction of a chicken or a duckling, supposing it to be even much more frequently chargeable against the weasel than it really is, would be but a trifling set-off against the benefit produced by the destruction of those swarms of little thieves." Like other creatures preying upon animals, the weasel itself falls a prey to enemies of superior strength; and instances have also been recorded where its sharp bite has enabled it to destroy its more powerful persecutor. The flexibility of the body in such cases is shown to be of essential service. Mr. Bell gives the following story:—"As a gentleman of the name of Pinder, then residing at Bloxworth in Dorsetshire, was riding over his grounds, he saw at a short distance from him a kite

pounce on some object on the ground, and rise with it in his talons. In a few moments, however, the kite began to show signs of great uneasiness, rising rapidly in the air, or as quickly falling, and wheeling irregularly round, whilst it was evidently endeavouring to force some obnoxious thing from it with its feet. After a short but sharp contest, the kite fell suddenly to the earth, not far from where Mr. Pinder was intently watching the manœuvre. He instantly rode up to the spot, when a weasel ran away from the kite apparently unhurt, leaving the bird dead, with a hole eaten through the skin under the wing, and the large bloodvessels of the part torn through." Respecting the geographical distribution of the weasel, it has a range almost coextensive with that of the ermine. Even in this country the fur of the weasel has been observed to grow whitish on the approach of winter, while in the higher American latitudes it usually becomes as white as the ermine after the cold season has fairly set in. In these cases the tail retains its normal light reddish-brown colour. In the spring the female produces either four or five young ones at a single birth.

THE VISON (*Vison lutreola*).—This species has been described under a variety of names, such as the vison-weasel, the mink, the minx-otter, and the jackash. It is a very common animal throughout Canada and the United States, as far south as Carolina. The body is nearly a foot and a half in length, exclusive of the tail, which would add seven or eight inches more. The head is small, terminating anteriorly in a short, flat, and abrupt muzzle. The ears are small and oval, the eyes being placed well forward. The cheeks are furnished with very strong, short, brown-coloured whiskers. The jaws are provided with thirty-four teeth, of which there are eighteen molars, four on either side above, and five correspondingly opposed below. The limbs are short, the toes being connected together by a membrane and entirely covered with hair; the claws are almost straight, and project very slightly. The fur is of a rich chocolate brown colour, paler on the head and underneath the body, but approaching to black on the back towards the tail. Near the root of this latter organ there are to be found the usual pair of anal glands, which give out a highly fetid secretion. Respecting its habits, Sir John Richardson remarks that "the vison passes much of its time in the water, and when pursued seeks shelter in that element in preference to endeavouring to escape to land, on which it travels slowly. It swims and dives well, and can remain a considerable time under water. Its short fur forming a smooth glossy coat, its tail exactly like that of an otter, and the shortness of its legs, denote its aquatic habits. It preys upon small fish, fish-spawn, fresh-water mussels, &c., in the summer; but in the winter, when its watery haunts are frozen over, it will hunt mice on land, or travel to a considerable distance through the snow in search of a rapid or fall, where there is still some open water." The same authority further observes that the vison "is not very timid when in the water, and will approach near to a canoe out of curiosity, diving, however, instantly on perceiving the flash of a gun, or any movement from whence it apprehends danger. It is easily tamed, and is capable of strong

attachment. In a domestic state it is observed to sleep much in the day, and to be fond of warmth. One which I saw in the possession of a Canadian woman, passed the day in her pocket, looking out occasionally when its attention was roused by any unusual noise. Like a cat, a tame vison is easily offended, and will, on a sudden provocation, bite those who are most kind to it." The female produces from four to seven young at a birth. The fur is not much valued by traders, nevertheless it appears to be of good quality, being soft, fine, and downy; the principal defect is, that it is very short.

THE OTTER (*Lutra vulgaris*), Plate 10, fig. 35.—

The genus of which this well-known animal forms a type is partly characterized by the possession of thirty-six teeth, and of these there are twenty molars, the sectorial or laniary grinder of the upper series being enormously developed, while the corresponding carnassials of the lower jaw are tuberculated at the posterior half; there are, in all, six true molars—one on either side of the upper jaw, and two to each divisional series below. In all the members of the genus the body is much lengthened, and in the species under consideration it is upwards of two feet long, exclusive of the tail, which would add nearly a foot and a half more. A full-sized otter will weigh about twenty-four pounds, but the naturalist Pennant has recorded one captured in the river Lea which weighed as much as forty pounds. The head of the common otter is broad and compact, and it terminates anteriorly in an abrupt wide muzzle, the upper lip being particularly thick and overlapping the lower. The ears are small, short, rounded, and widely separated; the eyes are remarkably prominent and placed far forward, about an inch from the tip of the nose. The limbs are short, and end in palmated pentadactylous feet, the several digits being connected together by a strong thick membrane, and they are also armed at the tip with short, non-retractile, but slightly elevated claws. The tail is flattened from above downwards, being immensely strong and broad at the root, in which latter situation, below, there occur the two usual anal glands similar to those described in other musteline genera. The fur is made up of two qualities of hair; the one kind is soft, fine, short, compact, of a whitish colour, save at the tips, where it is brown; the other is long, coarse, stiff, smooth, and somewhat darker externally at the point. This combination, therefore, is such that, while offering little or no resistance to the water during the forward progress of the animal, it, at the same time, preserves the body from sudden changes of temperature. In every part of the animal the muscular system is very highly developed, and to those who, like ourselves, affect to see much that is attractive even in the so-called dry details of myological anatomy, we could not point out a more beautiful display of muscles than such as may be witnessed by a careful dissection of the neck of the common otter. In point of fact, this creature is exquisitely organized both for rapidity of motion through the lambent waters of a rolling stream, and for overtaking and seizing the swiftest of its finny prey. The spindle-shaped body, elastic to a high degree, and bounded by harmonious curves—the projecting eye-

balls—the smooth, close, glossy fur—the broad rudder-forming tail—and the short, web-footed, fin-like limbs,—all combine to show its singular adaptiveness to the fluviatile and lacustrine haunts, where in ceaseless activity it despoils the waters of their abounding piscine treasures! Noiselessly it glides through the liquid medium, rivalling, surpassing, and overcoming the finny tribes; and one by one the latter fall victims to his trenchant grasp! In succession each captive is hurried to the bank, forthwith torn asunder, and the head severed in a moment's time! All this is common testimony which none will dispute. The common otter is, indeed, extremely voracious, and will destroy an incredible quantity of fish; for, when the latter are abundant, he has no sooner detached and devoured the head, and it may be a small additional portion of the body, than off he starts again, as if for the mere pleasure of the chase. Speaking of this animal's habits, Mr. Bell also observes that “the otter avails itself of any convenient excavation, particularly of the hollows beneath the overhanging roots of trees which grow on the banks of rivers, or any other secure and concealed hole near its fishing haunt; though in some cases it fixes its retreat at some distance from the water, and, when driven by a scanty supply of fish, it has been known to resort far inland to the neighbourhood of the farmyard, and attack lambs, sucking-pigs, and poultry—thus assuming for a time the habits of its more terrestrial congeners. It is asserted by some that the otter confines its haunts to the rivers and lakes, never descending to the sea. This, however, is a mistake. In the northern parts of Scotland they certainly frequent the sea, and extend their rambles to a considerable distance from the shore; and Mr. Couch of Polperro, states that “in the summer, and when the weather will permit, it occupies a retired and quiet station where the land stretches into the ocean. It swims low in the water, and will go a mile or more after its prey. The neighbourhood of a populous harbour is a frequent station. Fishes,” continues Mr. Couch, “seem to have an instinctive dread of the otter; for I am credibly informed that it has been seen to collect into a shoal a vast number of trouts in a river, and to drive them before until the greater part have thrown themselves on shore.” The otter has likewise its enemies. In former times the sport of otter hunting was much sought after in this country, as indeed it probably would also be at the present day, if those animals were only more abundant. In certain parts of Scotland, Wales, and Ireland, otters are still tolerably numerous; but if they were allowed to increase without any check, the more delicate sport of the fly-fisher would be seriously compromised. One of the most interesting facts connected with this persecuted animal is, that with care it may, when taken young, be completely domesticated, and not only become an agreeable companion, but even lend a hand to its master, should he be a fisherman in the ordinary sense of the term. In Sweden, the employment of this animal in the capture of fish appears to be no uncommon circumstance; and an instance has been recorded of an otter which captured eight or ten salmon in a single day. According to Mr. Bell, the following is a method of training recommended:—“They should be procured as young

as possible, and they are at first fed with small fish and water. Then bread and milk is to be alternated with the fish, and the proportion of the former gradually increased till they are led to live entirely on bread and milk. They are then taught to fetch and carry, exactly as dogs are trained to the same trick; and when they are brought to do this with ease and docility, a leather fish stuffed with wool is employed for the purpose. They are afterwards exercised with a dead fish, and chastised if they disobey or attempt to tear it; and finally, they are sent into the water after living ones. In this way, although the process is somewhat tedious, it is believed that the otter may be certainly domesticated, and rendered subservient to our use.” Independent, moreover, of their value as purveyors of fish, several accounts go to prove that, in the tame state, they become tractable, docile, and even amusing creatures. In the early spring of the year the female produces from three to five young at a birth. The flesh has a coarse fishy flavour, and is not considered good eating.

THE AMERICAN OTTER (*Lutra americana*) is a much larger species than the above. The body is three feet and a half in length, exclusive of the tail, for which we must reckon other eighteen inches. The fur is of a rich brown colour, not only on the back, but also underneath the belly; differing in this latter particular from the European species, which is lighter below. According to Hearn, the fur is nearly black in the summer, but in the winter it assumes the characteristic chocolate brown, a greyish spot being placed under the chin. This form of otter is widely distributed throughout the North American continent. Sir John Richardson states that it closely resembles the common otter in its habits and food. “In the winter season it frequents rapids and falls, to have the advantage of open water; and when its usual haunts are frozen over, it will travel to a great distance through the snow in search of a rapid that has resisted the severity of the weather. If seen and pursued by hunters on these journeys, it will throw itself forward on its belly, and slide through the snow for several yards, leaving a deep furrow behind it. This movement is repeated with so much rapidity, that even a swift runner on snow shoes has much trouble in overtaking it. It also doubles on its track with much cunning, and dives under the snow to elude its pursuers. When closely pressed, it will turn and defend itself with great obstinacy. In the spring of 1826, at Great Bear Lake, the otters frequently robbed our nets, which were set under the ice, at a distance of a few yards from a piece of open water. They generally carried off the heads of the fish, and left the bodies sticking in the net.” This last-named habit strikingly accords with what we have above remarked in regard to the common species, and it explains the extraordinary amount of destruction which these animals are known to create among fishes. The female American otter produces from one to three young at a single birth. The fur is of an excellent texture and quality, but its value is deteriorated by the circumstance of its being rather short; nevertheless, several thousand skins are annually imported into this country. In the list of Mustelidæ contained in the

British Museum, this species is denominated *Lataxina mollis*.

THE BRAZILIAN OTTER (*Lutra Braziliensis*) is, in point of mere size, very similar to the foregoing; the female examples, however, procured by the naturalist D'Azara, did not exceed four feet in length, including the tail, which measured twelve inches in the largest specimen. The fur has a fulvous yellow colour, generally, approaching to a chestnut hue on the limbs and tail. According to D'Azara, as quoted by Mr. Ogilby, this "species lives in troops, which sometimes, rising to the surface of the water, lift their heads and bark like dogs, with a hoarse voice in a menacing and snapping manner, without, however, injuring voyagers or swimmers. Each family seems to possess a separate domain. It spends nearly as much time upon the water as it does upon the land, where it devours the fish which it has taken, and rears its young in holes which it excavates in the banks. The same author was informed by the Payaguas Indians, who sail continually up and down the river, and are better acquainted with this animal than others, that the female brings forth two at a birth, covered with hair, and that many females bring forth and rear their young at the same time and in the same place—their usual resort throughout the year. The motions of this otter are generally slow, and it drags, as it were, its belly and muzzle along the ground; when it runs, it is not at all swift." By the Portuguese colonists of South America, the Brazilian otter is called Loto de Rio, or River-wolf. In the British Museum Catalogue, it is termed the 'Lutra.'

THE JAVANESE OTTER (*Aonyx Leptonyx*) is also known by the names of the simung and the wergul. It is a small species comparatively, the body measuring very little more than two feet, exclusive of the tail, which is about half that length. The character and texture of the fur is very similar to that of our common European species, but the brown colour has a much less rich tint, approaching more to a tawny aspect; the lower part of the face, throat, neck, and breast, being of a light dusky yellow. The whiskers are strongly developed in a double series on either side, one set of bristly hairs arising immediately below the nose, and the other from the posterior region of the cheek. Dr. Horsfield states that "the Javanese otter agrees in its manners with the common otter. It inhabits the banks of rivers, and lives on fishes. Its disposition, when found at large, is extremely ferocious; if attacked, it defends itself with courage. It is with great difficulty taken in its adult state; but, if obtained when young, it is mild and tractable. In this state it is occasionally seen in dwellings, but I never observed it to continue long in confinement. The natives distinguish two varieties of the Javanese otter, to one of which the name of wergul, to the other that of welingsang, is applied. The former is of a grey colour, and is said to be solitary, while the latter lives gregariously; but these statements require confirmation." The species under consideration is found in parts of the Indian Peninsula, Sumatra, Java, their adjacent isles, and the Continent of Siam. Its voice is said to bear some resemblance to that of a person crying. The female exhibits much solicitude and affection for her offspring.

THE SEA OTTER (*Enhydra marina*), or kalan of the Kamtschatkades, is a very remarkable animal, approximating closely to the pinnigrade seals in its habits and haunts. The length of the body is rather more than three feet, exclusive of the tail, which gives an additional seven or eight inches in a full-grown specimen. The head is rounded posteriorly, the outline, in a profile view, seen passing insensibly, as it were, into that of the strong, thick, muscular neck. The ears are remarkably small, and placed on a much lower level than the eyes. The whiskers are strongly developed. The limbs are short, more especially the anterior pair, and the hinder feet are comparatively more bulky than the fore ones, being also situated very far back. The toes are covered with hair, almost concealing the claws, and the outermost digit of the posterior feet is longer than any of the others. The fur varies in colour at different seasons of the year, and likewise according to the animal's age. Ordinarily, it is of a deep, sooty brown, or sometimes of a rich jet-black colour; but in young specimens it is lighter. There are two kinds of hair as usual; the longer are whitish, and overlap the more numerous soft, downy hairs, which lie partly concealed beneath. The fur has a beautiful, glossy, velvety texture; and, according to Captain Cook's account, is softer and finer than that of any other species. In early times, the skins appear to have fetched an extraordinary price; for Pallas states that single skins were sold at Kiachta, by the Russian furriers, at the rate of one hundred roubles—a sum of money equivalent to twenty pounds sterling. Even now, the sea otter's fur is highly prized, especially as its numbers have been so considerably reduced by the competition of Russian, Anglo-Indian, and American traders. This animal was formerly abundant on the islands skirting the north-eastern shores of Asia, Kamtschatka, the Kurile, and the Aleutian isles, but it is now almost limited to the western coasts of North America, extending as far south as California. The fur is purchased principally by the inhabitants of China and Japan. In a morphological point of view, the sea otter may be looked upon as an intermediate form between the fresh-water otters and the true maritime seals; and we also find that in its capacity for capturing fish, it appears to combine the special facilities of either species. It is essentially a marine animal, living very constantly in the open sea, and only frequenting the rocks for repose, and for the occasional purpose of rearing its young. The Russian traveller, Von Kotzebue, has given the following interesting account of the habits and mode of hunting the sea otter:—"They are often seen on the surface of the water, many miles from land, lying asleep on their backs, with their young, of which two are produced at a birth, resting upon them and sucking. The young cannot swim until they are several months old; but the mother, when she goes out to sea in search of food, carries them on her back, and brings them home to her hole in the rocks when she has duly satisfied her hunger. If seen by the hunters during these excursions, the female falls a sure prey to them; for she never forsakes her offspring however much they embarrass her swimming, but, in common with the male, defends them

courageously against every attack. The lungs are so constructed that they cannot subsist for more than a few minutes under water, but are necessitated to reascend to the surface for breath. These opportunities are seized by the hunters, who would seldom succeed if the otter could remain long under water, where it swims with great rapidity and skill. The hunters row in the little Aleutian baidars or boats round the coast, and for some miles out to sea, being provided with bows, arrows, and short javelins, which they discharge as soon as they observe an otter. The animal is seldom struck at first; it immediately dives, and as it swims very rapidly, the skill of the hunter is displayed in giving the canoe the same direction as that taken by the animal. As soon as the otter reappears on the water, it is once more fired at, when down it dives again; and the pursuit is thus continued until the creature becomes so weary that it is at length easily struck. Sometimes the otters succeed in tearing out with their teeth the arrows which have wounded them, and often, especially if their young are with them, boldly rush upon the canoes, and attack their persecutors—employing for this purpose their powerful teeth and claws. These conflicts, however, uniformly terminate in the defeat and death of the otter. The hunt is safer when the canoes are numerous, but, with experienced hunters, two boats are sufficient."

FAMILY III.—VIVERRIDÆ.

This family embraces a large section of the Carnivora, but the interest attaching to them being probably less than that accorded to any other subdivision of the Mammalia, we shall consequently devote a smaller space to their consideration. By many naturalists the hyænas are included in this group; yet, as they are clearly osculant between the civets and the cats, it is our intention to consider them as a separate family. The civets, properly so called, have usually forty teeth, their dental formula displaying the ordinary number of incisors and canines seen in the typical Carnivora, but almost invariably presenting twenty-four molars—that is to say, six above and below on either side; and of these, the anterior sixteen are spurious, while, of the remaining eight, six only are tuberculated—a pair of the inferior true molars being carnassial in their character. The tongue is furnished with numerous sharp, rough, horny papillæ, which are directed backwards. The feet are more or less digitigrade, being generally pentadactylous, but in some cases tetradactylous—the claws being slightly raised during progression. Sebaceous glandular follicles exist in the anal region, capable of secreting a more or less disagreeable foetid matter. The various kinds of viverrine carnivores are widely distributed over the eastern hemisphere. A solitary species of civet, with long hair, large ears, and a small pointed head, is known to inhabit Mexico. The naturalist Lichtenstein has described and figured it under the combined generic and specific title of *Bassaris astuta*.

THE GALET (*Cryptoprocta ferox*).—This creature is about the size of our common stoat. The body is very slender, terminating posteriorly in a long hairy

tail, having throughout an almost uniform thickness. The head is narrow; the muzzle being short, with the nostrils deeply notched laterally. The mouth and eyes are comparatively small, more particularly the former. The ears are remarkably large, conspicuous, and hairy; they have an oval outline, the margin being folded upon itself posteriorly; the internal surface is also marked by sinuosities. The whiskers are numerous and strongly developed. The limbs are stoutish, and of moderate length, the anterior pair being rather shorter than the hind ones. The feet are plantigrade and pentadactylous, the soles being naked, and the digits furnished with compressed, retractile, incurved claws; those of the anterior feet being more sharply pointed than the posterior series. The galet is a native of the island of Madagascar. Although plantigrade in its walk, most of the characters above recorded, as well as those of the dentition, serve to indicate a close alliance with the more highly carnivorous cats and dogs. It is to Mr. Bennett that naturalists are indebted for having early described this species in the first volume of the Zoological Society's Transactions.

THE DELUNDUNG (*Prionodon gracilis*) comes so near to the cats in certain particulars, that Dr. Horsfield originally described it as a species of *Felis* in his valuable "Zoological Researches in Java." It was discovered by him in the district of Blambangan at the eastern extremity of the island in the year 1806. The length of the body is about fifteen and a half inches, not including the tail, which would give us rather more than another foot. A glance at the excellent figure presented in the work above quoted, is sufficient to prove its distinctiveness as a separate species—the body being singularly elongated, vermiform, and rather slimly built. The tail is also very long, cylindrical, and particularly thick at the base, the outline of the rump being prolonged, as it were, into that of the extended caudal development. The head is tapering, and sharply pointed in front. The nose is elongated, naked, and furnished with laterally-placed nostrils. The jaws are provided with thirty-eight teeth, of which there are twenty-two molars, five on either side above, and six correspondingly opposed in each series below. The eyes are placed far forward, and have a circular pupil. The ears are rather small, short, rounded, and somewhat irregular at the margin. Long whiskers proceed from the upper lip, projecting backwards beyond the head; others also rise from the angles of the mouth, and from the interspaces between the eyes and ears. The feet are five-toed and digitigrade, being clothed with hair above and below. The digits are provided with minute, sharply-pointed, retractile claws. The delundung is an attractive and elegant species. "On a ground of pale, yellowish-white, which covers the throat, breast, belly, sides, and part of the back and tail, the distinguishing marks of a deep brown colour, inclining to black, are arranged in the following manner:—Four transverse bands, gradually increasing in breadth, cover the back at intervals between the limbs. On the rump are two narrow bands; two longitudinal stripes take their origin, one between the ears, the other near the posterior angle of the eye on each side, and pass, with

interruptions at the transverse bands, to the thighs, when they are continued by numerous large spots which cover these parts. From the shoulders and thighs, several obscure stripes pass to the feet, which have a dusky-grey colour. Between the origin of the longitudinal stripes of the body, and the transverse bands of the back, two smaller stripes are placed, which unite on the lower part of the neck from the opposite sides." Little or nothing is known of the habits of the Delungdung beyond such as may be legitimately inferred from its carnivorous structure, and from the circumstance of its being usually found in extensive forests.

THE MEERKAT (*Cynictis Steedmanni*).—Mr. Ogilby first accurately described this species in the Zoological Society's Transactions. It is an inhabitant of the district of Uytenday on the borders of Kaffraria. The term meerkat is applied by the South African colonists to signify almost any kind of small quadruped having burrowing habits. The body of the meerkat is about a foot and a half in length, exclusive of the tail which would give another twelve inches. The jaws are furnished with thirty-eight teeth, of which twenty-two are molars, twelve above and ten below; the last two on either side of the upper series, as well as one correspondingly opposed on each side below, being tuberculated. The limbs are slender and comparatively long. The feet are completely digitigrade, and provided with claws adapted to grubbing up the soil. The fore-feet are five-toed; but the hind-feet are tetradactylous. The fur has a bright reddish or chestnut tinge generally, being deeper coloured on the back. The tail is bushy like that of a fox, and shaded with dark-brown hairs, except at the tip, where it is of a uniform dull white. The texture of the fur is smooth, close, and fine. This animal appears to be tolerably abundant in the locality above mentioned, as several travellers have been careful to notice its occurrence. At a time when the meerkats were perhaps totally unknown to Europeans, the African traveller, Barrow, records the following little incident:—"An eagle," he says, "making a stoop at one of these, close to where we were passing, missed his prey, and both fell a sacrifice, one to the gun, the other to the dogs."

THE EGYPTIAN ICHNEUMON (*Herpestes Ichneumon*).—Plate 9, fig. 32. The various members of the genus *Herpestes*, are, amongst other things, characterized by the possession of forty teeth, of which twenty-four belong to the molar series, the last two on either side above, and the ultimate tooth of each corresponding group below, being tuberculated. The head is furnished with short and rounded ears, and the circumferential osseous ring of the orbital space is in most cases complete. The limbs are short, the feet being pentadactylous and armed with huge, compressed, incurved, and slightly retractile claws. The oval glandular pouch is remarkably capacious. The fur consists of long, rigid hairs, more or less annulated with alternating shades of dark and light tints. The Egyptian ichneumon is the best known of all the species, and is celebrated by Herodotus, Aristotle, and many other ancient writers. All sorts of fabulous stories, mixed with a certain degree of truth, have

been told respecting it; but the sober science of modern times very properly rejects such silly records as totally unworthy of belief. By European residents in Egypt the ichneumon is known by the name of Pharaoh's rat; but the native Arabs call it *nems* or *nims*. The traveller Sonnini, whose observations on this animal were made towards the close of the eighteenth century, was one of the first to give an accurate account of these creatures. Speaking of their habits he says that "they feed upon rats, birds, and reptiles. They ramble about the habitations of men; they even steal into them in order to surprise the poultry and devour their eggs. It is this natural fondness for eggs that prompts them frequently to scratch up the sand with the intention of discovering those that the crocodiles deposit there, and it is in this manner that they prevent, in reality, the excessive propagation of these detestable animals." The Egyptian ichneumon is readily domesticated, and specimens of it are always to be seen in living collections in this country. The fur has a peculiar dark tawny-grey aspect, resulting from the circumstance that the individual hairs are coloured with alternating rings of chestnut-brown and yellow. The muzzle and feet have a deep, reddish-brown tinge. The tail is long, thick, and bushy at the root. A full-grown ichneumon is about the size of an ordinary cat. When much excited it is said to growl and even bark.

THE MOONGUS (*Herpestes griseus*).—This animal is also known as the Indian ichneumon in contradistinction to the above-described species; but as there are several other allied forms inhabiting the great Asiatic peninsula and the adjacent islands, it is better to retain the more distinctive appellation here given. The moongus is celebrated for attacking venomous serpents, and it is said to have recourse to the plant called Hampadder-tanah or Mungo-root (*Ophorhiza mungos*) as an antidote to their venom. The plant is still employed as an antidote by the natives; but we do not place much faith in the above-mentioned statement, which was originally recorded and concocted by Rumphius. This animal's astonishing power of destroying vermin, however, has been satisfactorily demonstrated in our own country. Mr. Bennett, in his account of a specimen kept in the tower of London, relates that the beast actually destroyed, on one occasion, no fewer than a dozen full-grown rats which were loosed to it in a room sixteen feet square, accomplishing the slaughter in a minute and a half! The moongus may be readily tamed and taught to accompany its master anywhere, both in and out of doors.

THE GARANGAN (*Herpestes Javanicus*) is a native of Java, and is especially abundant in the large teak forests of that island. Like the last-described species, it is exceedingly destructive to serpents, which it attacks with great fury. Rats appear to be its favourite food; but it is also terribly destructive to chickens. In pursuing its prey it exercises much cunning and ingenuity. It is very easily domesticated; but its propensities for poultry deter the Javanese from showing it much regard. Moreover, it is said to be of a capricious disposition, occasionally indulging in fits of anger and violence. The fur of the garangan or

Javanese ichneumon, as it is sometimes called, is rather darker than that of the moongus and its allies.

THE RATLAMUCHI (*Herpestes badius*) inhabits the Cape of Good Hope and neighbouring parts of southern Africa. According to Dr. J. E. Gray, the fur is of a "red bay, the hairs being of a uniform colour, except a few just over the shoulder nape, which have a black sub-apical ring." The ratlamuchi, in common with its congeners, is very shy in the wild state, so that only very feeble glimpses can be obtained of it while it hurriedly escapes from one wood to another. There is every reason to believe that it feeds upon rats, mice, snakes, and lizards; but the stomachs of those examples obtained by Dr. Smith, who originally described the species, contained the remains of insects only. In the catalogue of Mammalia preserved in the British Museum, this species is denominated Smith's ichneumon or *Herpestes Smithii*.

THE SURICATE OR ZENIC (*Rhizæna tetradactyla*) is also a native of southern Africa, and is rather smaller than the Indian moongus, being about four feet long, including the tail, which is rather more than half the length of the body. The suricate possesses thirty-six teeth, twenty being molars, of which the anterior twelve are spurious. The four true grinders of the upper series and the two ultimate ones below are tuberculated. The orbital cavity is surrounded by a complete osseous ring. The ears are small, the muzzle much produced, the tongue being furnished with horny papillæ. The limbs are comparatively long, terminating in tetradactylous feet, whose digits are armed with strongly-developed, compressed, incurved claws. The tail is slender and pointed, and the anal region is supplied with the usual pair of glandular follicles. The fur of the zenie very closely resembles that of the ichneumon in respect of its

annulations and peculiar tinting. The colour is a mixture of yellow, white, brown, and black. The inner sides of the legs are yellowish-brown, and the hairs on the back are also darker, while the tail is marked with blackish tufts, especially at the tip. The habits of the suricate are similar to those of its congeners, feeding, as it does, upon rats, mice, &c. It is also reported to be exceedingly destructive to cockroaches.

THE MANGUE (*Crossarchus obscurus*).—This animal was first described by M. Friedrick Cuvier. It is an inhabitant of the district of Sierra Leone, on the west coast of Africa. In respect of size and general appearance it resembles the suricate. The head is more rounded posteriorly than in the ichneumons; but the bony orbital ring is incomplete behind. The muzzle is very much produced or probosciform; and the jaws are furnished with twenty molars, the caninaries or carnassials being surmounted with acute conical tubercles. The ears are small, round, and bilobulated. The central papillæ of the tongue are horny. The feet are plantigrade and pentadactylous, while the tail is flattened, of moderate length, but considerably thicker than that of the suricate. In the anal region there is a solitary glandular pouch. The body is only sixteen inches in length, not including the tail, which measures some eight inches. The fur presents a tolerably uniform brownish colour, except on the sides of the head, where it is much paler. The mangué feeds on small quadrupeds, insects, and fruits; and in the domesticated state it is a cleanly docile creature.

THE POUGONNE (*Paradoxurus typus*).—As this animal, in common with several of its allies, is called the *musang*, we purposely retain the subjoined distinctive title. The term Paradoxure, by which it is

Fig. 27.

The Pougonne (*Paradoxurus typus*).

likewise well known, is also applicable to other species of the same genus; while to employ the name of palm-marten given to it by the French, would involve the same uncertainty, being open to precisely similar objections. The Pougonne (fig. 27), is a native of India, and is quite distinct from the genets, with which,

however, it has been frequently confounded. The head exhibits a thoroughly canine aspect, and the muzzle is much pointed. The jaws are supplied with forty teeth, twenty-four of them being molars. The pupil of the eye is slit longitudinally, the ears being rather large and rounded. The body is stoutish, and

provided with short limbs, the feet being semi-palmate, plantigrade, and pentadactylous. The claws are slightly retractile. The odoriferous secreting pouch is represented by a superficial granular space, placed a little below the anal opening. The tail is as long as the body, cylindrical, slightly flattened from above downwards, and non-prehensile; in the example described by F. Cuvier it was found spirally folded upon itself, as in the figure here given. The fur of the pougonne has a more or less brownish tint generally, being marked on the back and sides with darker patches of the same colour, somewhat irregularly disposed. Its habits correspond with those of the species of this family whose food is of a mixed character.

THE COMMON GENET (*Genetta vulgaris*), is an inhabitant of the south of France, of Spain, and of the African continent throughout its entire length and breadth. It is generally found in the low grounds, near the edges of rivers, or in the immediate neighbourhood of springs. The Genet very much resembles an ordinary cat, and in the domesticated condition forms a very good substitute, catching and killing mice with equal skill. The various members of the genus *Genetta* are distinguished by their vertically slit pupils, and by their completely retractile claws, in which respect they approximate very closely to the Felidæ. The odoriferous anal pouches are reduced to a mere depression in the skin, the amount of the secretion being correspondingly deficient; nevertheless quite enough to produce a very perceptible odour. The Genets are smaller than the true civets, and less frugivorous in their habits. The fur of the species under consideration is more or less greyish and spotted, with conspicuous oval, oblong, or rounded patches of a brownish-black colour, the cheeks and sides of the muzzle being covered with white markings.

The tail is beautifully annulated with upwards of twenty alternating white and black bands. It is as long as the body, and tapers very gently towards the tip, where it is also clothed with long coarse hair. Its dental arrangement is precisely similar to that of the civets, properly so called.

THE LUWAK (*Viverra musanga*), is a well-marked form, although it resembles the genet in size and many other particulars. The head is broad behind, ending anteriorly in a sharply pointed muzzle. The jaws are furnished with twenty molar teeth, which are comparatively short and broad. The body is about twenty-two inches long, exclusive of the tail, which would give us another foot and a half. The general colour of the fur is that of a deep tawny-brown; the head, central line of the back, tail, and outer sides of

the limbs being almost black. A whitish-grey band passes backwards from the eye, gradually increasing in breadth until it arrives at the centre of the neck. The pupils of the eyes are rounded. The limbs are robust, terminating in pentadactylous feet, armed with large, strong, semi-retractile claws. In regard to the habits of the Luwak, Dr. Horsfield states that they are "very similar to those of the genet. If taken while young, it becomes patient and gentle during confinement, and receives readily animal and vegetable food. It requires little attention, and even contents itself with the scanty remains of the meals of the natives, with fish, eggs, rice, potatoes, &c., the structure of its teeth being particularly adapted to a vegetable diet. It prefers, however, delicate and pulpy fruits, but when pressed by hunger, also attacks fowls and birds." The Luwak, we are told, causes terrible damage to the coffee plantations, devouring the berries with excessive greediness. On this account some have called it the "coffee rat." Only the arillus and external coverings of the berry are consumed, the seed itself passing through the animal unaffected by the digestive powers of the animal's stomach. The Luwak is pretty widely dis-

Fig. 28.

The Rasse (*Viverra Rasse*).

tributed, being found in Sumatra, Java, the Malayan peninsula, and in most of the adjacent islands of the Indian archipelago.

THE RASSE (*Viverra Rasse*), is a remarkably handsome creature, and is readily distinguished from its congeners by its elongated form, delicate build, and elegant colouring (fig. 28). It is also a native of Java and the adjoining isles. The length of the body is nearly two feet, not including the tail, which would give us another twelve inches. The head is cuneiform, compressed sideways, terminating anteriorly in a very attenuated muzzle. The ears are particularly broad at the base, closely approximating to each other on the crown of the head. The eyes are dark-coloured. The whiskers are few in number, but of considerable length. The limbs are of moderate size, and terminate in digitigrade

pentadactylous feet, armed with acute semi-retractile claws. A solitary glandular pouch exists in the anal region. The general aspect of the fur is tawny grey, prettily marked with dark-brown or blackish spots, in addition to which there are eight dark-coloured parallel bands passing from the shoulders to the posterior extremity of the rump, four of them being situated on either side, and immediately below the central line of the back. The dark spots above mentioned have also a tendency to arrange themselves in linear series. The tail is striped with sixteen circular alternating bands of a black and whitish-grey colour. The Rasse "preys on small birds and animals of every description. It possesses the sanguinary appetite of animals of this family in a high degree, and the structure of the teeth strictly corresponds with its habits. In confinement it will devour a mixed diet, and is fed on eggs, fish, flesh, and rice. Salt is reported by the natives to be a poison to it." The odoriferous secretion from the anal glands is termed *dedes* by the Javanese and *jibet* by the Malays, and Dr. Horsfield further informs us that it is quite a "favourite perfume among the Javanese, and applied both to their dresses, and, by means of various unguents and mixtures of flowers, to their persons. Even the apartments and the furniture of natives of rank are generally scented with it to such a degree as to be offensive to Europeans, and at their feasts and public processions the air is widely filled with this odour."

THE TANGGALUNG (*Viverra zibetha*) is a very widely distributed species throughout the more southern portions of the great Asiatic continent, extending from Arabia on the west to the coast of Malabar on the east, and also occupying Sumatra, Java, Borneo, and other islands of the Indian archipelago. The term Tanggalung is of Malayau origin; but this species is also called the Indian civet, and by the native Hindoos is known by the name of the *Kutauss*. It is a comparatively strong and bulky species, having a short thick neck and somewhat rounded head. The ears are very much wider apart than obtains in the Rasse, leaving an interspace of about two inches width. The tail is cylindrical, nearly uniform in thickness, and shorter than the body; it is somewhat indistinctly striped with alternating black and light-brown rings. The fur has a light-brownish ashy-grey colour, being marked with small black spots arranged in a transversely undulating manner. The throat and lower parts of the belly are whitish. Dr. Horsfield says that this animal has a comparatively mild disposition; but his remarks evidently apply to it when in a semi-domesticated condition. Captain Thomas Williamson's account of the wild Indian civet affords a clearer estimate of its naturally ferocious character. "This animal," he says, "is perhaps the most obnoxious of all the wild tribes known in India. It is seldom, if ever, seen on a plain, except at night, when it leaves its haunt in quest of prey. The Kutauss is remarkably bold, sparing nothing which it can overcome, and frequently killing, as it were, merely for sport. Its principal devastations are among sheep and swine, from which it purloins the young, and commits dreadful havoc among poultry. To the rapacity of the wolf it

joins the agility of the cat and the cunning of the fox." The same excellent observer tells us that it "is generally found in short underwood covers, mixed more or less with long grass, and especially where the palmyra or cocoa tree is to be seen. Although it is sometimes met with in various detached jungles, yet, for the most part, its residence is confined to such as border old tanks or jeels. The banks being formed by the excavation, are often very high and broad; with time they settle and become flatter, and are generally overrun with very strong brambles, through which even an elephant could not make his way without extreme difficulty. Of such covers the Kutauss is a regular inhabitant, seldom stirring in the day, during which time he appears to hide himself in the most opaque recesses." The Kutauss ascends trees with facility, and when chased by hunters makes a very powerful resistance. The odour which it emits is similar to that of the Rasse, and, like the jibet, is duly extolled by the natives as a delightful perfume. It is, however, highly offensive to Europeans, and Captain Williams states that the hunters' dogs in Bengal become perfectly sick with the stench; nevertheless there is no animal which they will so readily attack, and after they have worried a Kutauss nothing will induce them to pursue any other kind of game—until at least the smell of the beast has entirely quitted their nostrils. Kutausses only frequent the neighbourhood of such villages as are inhabited by Mussulmans, simply because no poultry can be stolen from those populated by Hindoos, whose religion forbids the rearing of chickens and fowls. Unclean animals all!

THE AFRICAN CIVET (*Viverra civetta*)—Plate 9, fig. 31—is the species most commonly known, and it is from this animal that the unctuous brown substance termed "civet" is chiefly procured. The fatty matter in question is obtained from the two anal glandular pouches, so frequently alluded to in other viverrine genera. In the fresh state its odour is extremely disagreeable; but when very copiously diluted and mixed with other perfumes—the energy of which it appears to have the power of augmenting—the combination is considered pleasant. The Civet is most abundant in North Africa; but it is also found on the coast of Guinea and at other parts of the continent as far south as the Mozambique. In the domesticated condition this animal exhibits a very capricious temper; but large numbers of Civets are kept for the sake of procuring the oily perfume. We are told that the unfortunate captives have their dignity insulted about twice a week. Thus, the tails being raised, and the hinder parts fixed to the bars of their cages *in situ*, a sort of iron scoop is unceremoniously introduced into the before-mentioned pouches, and the glands are relieved of their odoriferous contents. The African civet is larger than the Tanggalung, the body being nearly three feet long, not including the tail, which measures about eighteen inches. The fur has a light brownish-grey colour, with spots and bands of a darker brown or blackish tint. The hairs along the central line of the back and neck are sufficiently elongated to form a kind of mane, which can be raised or depressed at will. The hairs of the tail are also long, and being whitish

with black ends, they impart to the organ a more or less ringed appearance. The habits of the African civet are by preference nocturnal. It is a good climber, and although particularly fond of birds and small quadrupeds, it does not reject fruits, roots, and other vegetable matters.

FAMILY IV.—HYÆNIDÆ.

In a zoological point of view, this family cannot be considered as equivalent to any of the three foregoing carnivorous groups. It is clearly osculant between the Viverridæ and Felidæ, resembling the cats in its dental formula, and the civets in nearly all other respects. In addition to the usual six incisives and four canines, the Hyænas have eighteen molars, of which the anterior fourteen, that is, eight above and six below, are, according to the view of Professor Owen, spurious; whilst, of the four remaining true molars, the upper pair are tuberculated, those of the lower series remaining sectorial in their character. The Hyænas are further distinguished by their peculiar gait, depending upon the paramount lengthening of the anterior limbs as compared with the hind legs. This elongation is perhaps, on the whole, more apparent than real; nevertheless, taken separately, the tibia and fibula of the posterior extremity are shorter than the corresponding radius and ulna of the fore-limb. The feet are all tetradactylous. The ears are large, the eyes prominent, and the tongue covered with horny papillæ. The body gradually declines from the shoulder towards the tail, supporting a bushy mane on the neck and central line of the back. There are fifteen or sixteen pair of ribs. The tail is rather short, the anal glandular pouches being deep and capacious. So far as at present known, this family is exclusively confined to the eastern hemisphere. Numerous fossil remains of Hyænas occur in the pliocene deposits, and more particularly in the ossiferous caverns of Great Britain and central Europe.

THE AARD-WOLF (*Proteles Lalandii*)—fig. 29.—This is a very interesting animal, inasmuch as it constitutes one of those transitional or aberrant forms which serve to demonstrate the unity of plan pervading all organized beings. The various species which inhabit this planet, whether animal or vegetable, are not to be regarded as creations representing so many totally different designs, but they are rather to be looked upon as special modifications of one common archetypal plan. Speaking of secondary causes, we may say that nature developes progressively, and in accordance with the motto, "*Nihil per saltum*." Such a view is at the same time quite consistent with the notion that each animal—the Aard-wolf, for example—is an independent entity, a distinct species, a separate creation, an expression of the Divine will.

Observe how closely this creature resembles several other allied forms. In general appearance and attitude it is like the true hyænas, and this apparent identity is perhaps even more obvious in the dentition and in the structure of the skeleton. In respect of its size, the form of the head, and in the circumstance of its excavating burrows for diurnal retreat, we notice its fox-like qualities, while in several other particulars it approaches the civets. The molars are small, and vary in number from sixteen to twenty. The fore-feet are pentadactylous, having the digit of the thumb

Fig. 29.



The Aard-Wolf (*Proteles Lalandii*).

slightly raised. The hind-feet have only four toes. The tail is comparatively short. The texture of the fur is soft and woolly, except along the central line of the back and neck, where it is long and rigid, and forms an erectile mane, the individual hairs being upwards of six inches long. The body displays a yellowish ashy-brown colour, the sides being irregularly banded with eight or ten dark-brown stripes, whilst the legs are also lined with similar transverse markings. Like its congeners, the habits of the Aard-wolf are nocturnal, and it feeds on various kinds of animal and vegetable food, and from the observations of Sparrman, appears to be very partial to ants, thus reminding us also of the insectivorous habits of the bears. On the approach of daylight he retires to his self-constructed subterranean burrow, and there lies concealed during the day. Aard-wolves are remarkably timid and shy; and, as if to increase their security, they not only make their burrows near each other, but many are frequently found occupying the same hole, which, however, may have several outlets, so that they can all escape if disturbed. They are thus gregarious in their habits, and are also swift runners, notwithstanding the disproportion which exists between the anterior and posterior extremities.

THE STRIPED HYÆNA (*Hyæna striata*)—Plate 9, fig. 30.—This is the most widely distributed species, being found in abundance in the greater part of central Asia, Hindoostan, Asiatic Turkey, Persia, Syria, and northern Africa. It is recognized by its brownish-

grey colour, which is darker along the central line of the back and neck, where the hairs are prolonged to form an erectile mane, the sides of the body being also marked by several dark-brown bands. All the hyænas display remarkable strength and voracity, their jaws being eminently fitted for tearing and crushing the hardest substances. At night they prowl about in large numbers, devouring alike living and dead animals, whether the latter be fresh or semiputrid. Graves are torn open without ceremony—a circumstance which has given rise to various superstitions and silly tales, which ancient writers ignorantly delighted to record. The Striped hyæna is not very particular as to the character or size of his victim. Colonel Denham, when at Kouka, informs us that a legion of this species literally stormed a large village in that neighbourhood one night, and, notwithstanding that the place was surrounded by a barricade, consisting of branches of the prickly tulip nearly six feet in height, they succeeded in throwing it down and taking away two donkeys. He adds—"We constantly heard them close to the walls of our own town at nights, and on a gate being left partly open, they would enter and carry off any unfortunate animal that they could find in the streets." It has often been stated that hyænas cannot be tamed—a notion which is entirely erroneous. Among the very many proofs which have been adduced to show that the species under consideration is quite capable of domestication, we may refer to Mr. Bennett's account of a Striped hyæna kept in the tower of London, which manifested remarkable docility and attachment to its keeper. It may also be mentioned, on the authority of Colonel Sykes, that in central India, where the species is numerous, they are found to be as susceptible of domestication as ordinary dogs.

THE SPOTTED HYÆNA (*Hyæna crocuta*).—This is called the "Tiger-wolf" by the colonists at the Cape of Good Hope, and it is often spoken of simply as the Wolf, in contradistinction to the next species, which is termed the Strand-wolf. Though most abundant in Southern Africa, the Spotted hyæna is found as far north and west as the coast of Guinea and Senegal, and even Barbary, if the statements of Lesson are correct. It is rather smaller than the last-described species, and is further distinguished by the absence of any well-marked mane, as well as by the circumstance that the fur is covered with roundish black spots, instead of stripes, which, nevertheless, exhibit a tendency to arrange themselves in linear series. The general colour of the fur is yellowish-brown, the hairs being comparatively short. The tail is bushy, and of a brownish-black tinge. The habits of the Spotted hyæna appear to be even more destructive than those of the striped species. Numerous accounts have been placed on record respecting its extraordinary rapacity, but of these we shall refer only to the more interesting. The traveller Steedman gives the following account of its depredations, as communicated to him by a trustworthy correspondent, who writes from Mamboland as follows:—"To show clearly the preference of the wolf (*i.e.*, Spotted hyæna) for human flesh, it will be necessary to notice, that when the Mambookies build their houses, which are in form like beehives, and tolerably large—

often eighteen or twenty feet in diameter—the floor is raised at the higher or back part of the house, until within three or four feet of the front, where it suddenly terminates, leaving an area from thence to the wall, in which every midnight the calves are tied, to protect them from the storms or from wild beasts. Now it would be natural to suppose, that should the wolf (hyæna) enter, he would seize the first object for his prey, especially as the natives always lie with the fire at their feet; but notwithstanding this, the constant practice of this animal has been in every instance to pass by the calves in the area, and even by the fire, and to take the children from under the mother's kaross; and this in such a gentle and cautious manner, that the poor parent has been unconscious of her loss, until the cries of her little innocent have reached her from without, when a close prisoner in the jaws of the monster." The same writer avers, that there had come to his knowledge no less than forty instances where these beasts had thus committed serious havoc within the space of only a few months. The Spotted hyæna is a great coward, for he will usually only attack his intended victim after he has succeeded in intimidating him, and in making him run for his life. To bring about this result, he utters hideous howls, and puts on every kind of snarl and grimace which his villanous physiognomy can conjure up. This propensity to howl, however, seems to be rather disadvantageous than otherwise, seeing that it serves as a warning to the occupants of farm-yards and villages. Its design is probably to inspire terror, and not to call together other hyænas of the same species, as some have supposed. Various methods are adopted to destroy this pest, the best of which seems to be that of a spring-gun trap, set in the following manner:—"Two young trees are selected, and divested of their lower branches, or, in lieu of such, a couple of stout posts, firmly driven into the ground, will answer the purpose equally well. To these trees or posts, as the case may be, the gun is firmly lashed in a horizontal position, and with the muzzle pointing slightly upwards. A piece of wood about six inches in length—the lever, in short—is tied to the side of the gun-stock, in such a manner as to move slightly forwards and backwards. A stout piece of string connects the trigger with the lower part of the lever. To the upper extremity of the latter is attached a long piece of cord, to the outer end of which, after it has been passed through one of the empty ramrod tubes, is tied a lump of flesh, which is pushed over the muzzle of the gun." By this contrivance Mr. Anderson and his friends succeeded in destroying several hyænas. The same sportsman and author records in his "Lake Ngami" the following curious incident. While stationed at Great Namaqua-land, he says—"Almost the first animal I saw at this place was a gigantic 'tiger-wolf,' or Spotted hyæna, which, to my surprise, instead of seeking safety in flight, remained stationary, grinning in the most ghastly manner. Having approached within twenty paces I perceived to my horror, that his fore-paws, and the skin and flesh of his front legs, had been gnawed away, and that he could scarcely move from the spot. To shorten the sufferings of the poor beast, I seized my opportunity, and knocked him on the head with a stone;

and, catching him by the tail, drove my hunting-knife deep into his side. But I had to repeat the operation more than once before I could put an end to his existence. I am at a loss how to account for his mangled condition. It certainly could not have been from age, for his teeth were good. Could it be possible that from want of food he had become too weak for further exertions, and that as a last resource he had attacked his own body? Or was he an example of that extraordinary species of cruelty said to be practised by the lion on the hyæna, when the latter has the insolence to interfere with the monarch's prey?" We are inclined to believe neither of these ingenious views are correct, but that the poor beast had gnawed its limbs on account of some local disease. We noticed, a few years ago, an unfortunate hyæna in the Dublin Zoological Gardens, which, from some local irritation at the part, had, by constant biting and sucking, so reduced its caudal appendage, that scarcely any trace of the tail remained. We suggested to Dr. Ball that it should be destroyed, but that distinguished naturalist did not seem inclined to adopt Mr. Andersson's judicious method of consoling the afflicted; expressing his belief that the animal would get better!

THE WOOLLY HYÆNA (*Hyæna villosa*).—This species was first described by Dr. Andrew Smith in the 15th volume of the Linnæan Society's Transactions. It is called the "Strand-wolf" by the Cape colonists, and, when young, bears a very close resemblance to the striped hyæna, from which circumstance some have stated that the latter is also found in South Africa. This is not the case, unless, indeed, the persuasion that the Woolly hyæna is nothing more than a well-marked variety of the species under consideration, should gain universal acceptance. The distinguished author of the "Catalogue of Mammalia," preserved in the British Museum, entertains this view. In the meantime we may observe, that a fourth kind has been described—the Brown hyæna (*Hyæna rufa*)—which is also a South African species. The fur of the Woolly hyæna is long and coarse, but it does not form an erectile mane along the central line of the back. The body has a greyish-brown colour, with indistinct markings of a darker hue, transversely arranged on the sides and hips, and other more conspicuous ones on the legs. The tail has a deep-brown tinge, and is longer than in the ordinary striped hyæna. The head is lined with dark patches beneath the eyes, on the chin, and at the point of junction of the cheeks and neck. The ears are comparatively large, straight, and pointed. Its habits are similar to those of other hyænas, but it frequently resorts to the sea-coast, where it greedily devours carcasses of whales, and the semiputrid remains of any other animals which by chance may have been washed ashore. It is not so common a species as the spotted hyæna.

FAMILY V.—CANIDÆ.

The Dogs form a small natural group, although the individual members of the family are extremely numerous, owing to the circumstance that a solitary species has given origin to a multitude of well-marked and more

or less permanent varieties, forming a series of domesticated races. Besides the ordinary complement of twelve incisive and four canine teeth, the dogs are usually furnished with twenty-six molars, but in some instances as many as thirty-two have been present. Ordinarily, there are six molars on either side above, and seven correspondingly opposed below. Of these, the last pair on either side, above and beneath, are generally tuberculated; sometimes the latter three of each series are thus characterized. The tongue is soft, and not armed with horny papillæ. The feet are digitigrade, and furnished with five toes in front, but the hind limbs are, in most cases, only tetradactylous. Dogs have no anal glandular pouch. The cœcum is well developed, and of a spiral form. These animals are found in all parts of the habitable globe. Fossil remains of dogs and wolves have been found in the bone-caverns of Liège, and also in England, at Overton near Plymouth, and at Paviland in Glamorganshire. A careful examination of these fossils has led Professor Owen to advocate the view, that all the varieties of dogs are specifically identical with the common Wolf.

THE MARBLED LYCAON (*Lycaon venatica*).—This is the wild dog or Wilde Hond of the Cape colonists. In external appearance it very closely resembles a hyæna, and it was originally described by Burchell as a member of that genus, under the title of *Hyæna picta*. It is, however, a nearer approach to the true dogs. This is more especially seen in the character of the dentition, and in the structure of the skeleton. Its height at the shoulder is rather under two feet from the ground, but it looks somewhat taller at first sight on account of its slight, gaunt figure. The limbs are long and narrow, all of them terminating in tetradactylous feet. The fur has a yellowish-brown colour, and is irregularly marbled with black and variegated spots of an exceedingly irregular shape. The head is like that of a hyæna; the muzzle is pointed, and of a black colour. The ears are remarkably large. The tail is moderately long, bushy like that of a fox, and divided near the middle by a black ring, above which the colour is sandy, and white below. According to Mr. Burchell, from whose description these characters are partly derived, the Lycaon hunts in large organized packs, by preference at night, but occasionally also by day. It appears to be a bolder animal than the hyæna, very swift of foot, attacking sheep openly, but employing more caution in the case of horses and large cattle.

THE LALANDE (*Otocyon Lalandii*).—This animal is rather smaller than an ordinary fox, and is also an inhabitant of Southern Africa. The fur is greyish. The tail is moderately long, bushy, black at the upper part, and also at the extremity. The body stands comparatively high, the limbs being lengthy and slender. The head is furnished with remarkably large, long, and straight ears. The teeth are forty-eight in number, there being no less than thirty-two molars. One of the most distinctive peculiarities of the Lalande has reference to the character of these molar teeth, fifteen of which are tuberculated—all the true grinders, in short, four of them belonging to each lateral division above, and three correspondingly opposed in each series below. The food of the Lalande is principally frugivorous.

THE FENNEC (*Vulpes Zerda*)—Plate 7, fig. 25—is more closely allied to the foxes and true dogs, with which, indeed, its dentition entirely coincides. It resembles the foregoing species chiefly in respect of its ears, which are extremely long, and in the circumstance of its slight build and small body. The tail is well developed, and dark-coloured at the root and tip; but in other respects it partakes of the general colour and character of the fur, which is of a whitish, fulvous, or light isabel tint throughout, being almost white beneath the belly. Its texture is fine and woolly. The Fennec is an inhabitant of the sandy plains of Nubia, where it excavates burrows. It also ascends trees with facility. A specimen in possession of Mr. Brande, the Swedish consul at Algiers, was particularly partial to dates and other sweet fruits, and also to eggs. The sight of a bird, however, was sufficient to produce violent excitement. The Fennec does not nestle in trees as the traveller Bruce supposed.

THE COMMON FOX (*Vulpes vulgaris*)—Plate 7, fig. 26.—If the "Museum of Natural History" were exclusively devoted to the consideration of those animals which afford sport, in the ordinary acceptance of the term, our readers would in this place probably expect a brilliant record of daring leaps and other adventures, which are the ordinary accompaniments of the chase after a fox. Due regard, however, being paid to the habits of the more rare and important quadrupeds of foreign countries, we must necessarily limit our details respecting such natural history and sporting data as the records of the fox-hunter furnish; moreover, special works are devoted to this subject, as well as to other matters of interest connected with it. Who is not familiar with the common fox, with its rufous brown fur and bushy tail—or "brush," as it is termed by hunters—tipped with white? The sharp muzzle, the shrewd look, the penetrating eye with its elliptically contracted pupil, the triangular pointed ears, the fetid odour, and the cunning step—these, and many other well-known features, are characters by which Reynard may be easily distinguished. Associated with this aspect and attitude, we may also be reminded of its burrowing propensities, its power of eluding pursuit, its skill as a poacher, its swiftness of flight, its sagacity in detecting traps, its wily instinct in securing food, &c.—peculiarities which have over and over again been celebrated in story-books from the earliest times; neither need any doubt be entertained of the general correctness of those serious charges which have from time to time been laid at its door, or, as a hunter would say, at the entrance of its "earth." Notwithstanding all this, Reynard has many friends among English gentry, although it cannot be urged that this friendship is in any degree disinterested. On the contrary, Reynard is esteemed only for the sport he creates. However destructive he may prove among the occupants of a farmyard, woe betide the tenant-farmer who ventures to destroy him, and so possibly abridge his landlord's pastime. Let Reynard devour hares, rabbits, pheasants, partridges, ducks, geese, chickens, and whatever else he may please to lay his claws upon; but kill him not, lest the tread of the noble fox-hunter's steed be obliterated from the upturned soil! Through this barrier

of hunting etiquette, however, a breach is sometimes made; and not long ago the author of the present section of this work was visiting a gentleman at Attleborough in Norfolk, who, when out shooting on a nobleman's estate in the same county, deliberately—with his host's consent and approbation—rolled over a pair of foxes, one with the right-hand barrel, and the other with the left! As may be supposed, such a clever feat of arms gave considerable offence to the fox-hunting gentry of the district, while the farmers and lovers of partridge-shooting only offered their congratulations. The common fox is widely distributed over Europe, and is also found, according to several authorities, in Egypt and other parts of Northern Africa.

THE AMERICAN RED FOX (*Vulpes fulvus*) has been considered by many as a mere variety of the common species above described; there is, however, good ground for believing this view to be erroneous. According to Mr. Sabine's description, this animal exhibits "a general bright ferruginous colour on the head, back, and sides, less brilliant towards the tail; under the chin white; the throat and neck a dark-grey; and this colour is continued along the first part of the belly in a stripe of less width than on the breast; the under parts, towards the tail, are very pale red; the fronts of the fore-legs and the feet are black, and the fronts of the lower part of the hind-legs are also black; the tail is very bushy, but less ferruginous than the body, the hairs mostly terminated with black, and more so towards the extremity than near the root, giving the whole a dark appearance; a few of the hairs at the end are lighter, but it is not tipped with white." We can testify to the accuracy of this description of the fur, having ourselves not only carefully examined several examples, but having also dissected a specimen. Speaking of its habits, Sir John Richardson states that the American Red fox is not so swift as its English congener. It runs rapidly for a short distance, "but its strength is exhausted in the first burst, and it is soon overtaken by a wolf or a mounted huntsman. Its flesh is ill-tasted, and is eaten only through necessity." The female produces four young at a birth, the cubs having a soft downy fur of a yellowish-grey colour. The Red fox is very abundant in the well-wooded districts of North America, many thousand skins being annually imported into England by the Hudson's Bay Company.

THE KIT-FOX (*Vulpes cinereo-argenteus*) is also a North American species, extending from the plains of the Saskatchewan territory to those of Columbia. It is a very small species, measuring about twenty-two inches in length, exclusive of the tail, which would give us nearly another foot. Its face and muzzle are comparatively short and broad. On the upper part of the body the fur presents a peculiar colour, "produced by an intermixture of hairs tipped with brown, black, and white." Underneath the neck and belly it is of a dull rufous orange colour, the hairs in this situation being also longer. The lower parts of the face about the mouth are whitish, and more or less tinged with blackish-brown at the margins. The whiskers are strongly developed and dark-coloured. The tail is

bushy, of a yellowish-grey colour, gradually tapering towards the extremity, where it is black.

THE ARCTIC FOX (*Vulpes lagopus*) is as commonly known by the designation of Blue fox, on account of its peculiar deep ashy, leaden, or bluish-coloured hair. The fur varies much in appearance at different periods of the year, and according to the place of abode; being very commonly of a brownish-grey colour in some districts, and in others sooty or almost black. In the winter the fur usually becomes pure white or whitish-yellow; but this is not invariably the case, as the sooty variety is said scarcely to alter its colour in any respect; its texture is woolly, the individual hairs being comparatively long. The Arctic fox is considerably less than our European species, the tail being well developed and very bushy towards the tip. The ears are short and rounded, having a cropped appearance owing to a peculiar arrangement of the hairs; the latter are particularly thick and long at the posterior part of the cheeks. According to Captain Lyon, "the Arctic fox is an extremely cleanly animal, being very careful not to dirty those places in which he eats or sleeps. No unpleasant smell is to be perceived, even in a male, which is a remarkable circumstance. To come unawares on one of these creatures is, in my opinion impossible; for even when in an apparently sound sleep, they open their eyes at the slightest noise which is made near them, although they pay no attention to sounds when at a short distance. The general time of rest is during the daylight, in which they appear listless and inactive; but the night no sooner sets in than all their faculties are awakened; they commence their gambols, and continue in unceasing and rapid motion until the morning. While hunting for food they are mute; but when in captivity or irritated, they utter a short growl like that of a young puppy. It is a singular fact that their bark is so modulated, as to give an idea that the animal is at a distance, although at the very moment he lies at your feet." The same gentleman observes, that when taken they at first display great anger, but after a few hours' confinement they gradually cool down to a state of easy quietude; instances also occur where they have become quite tame. The Arctic fox displays far less cunning than our European species, and is not so suspicious of traps. The female produces from three to five young at a birth. This animal is an inhabitant of the sub-polar regions of either division of the Northern hemisphere, being found in North America, Lapland, Iceland, Siberia, and Kamtschatka. We have also been informed by a Russian gentleman from the neighbourhood of Archangel, that the sport of hunting blue foxes is particularly excellent in the large isles of Nova Zembla. Ordinarily, Arctic foxes are captured by an elevated pit-fall, the pit consisting of an elevated hut built up with stones, and arched over, leaving only an aperture at the summit, over which blades of whalebone are fixed in such a manner as to insure the certain precipitation of the fox into the interior, should the bait, also placed at the upper part, successfully allure him on to the top of the roof. In the young state, the flesh of the Arctic fox is stated to be excellent eating. The fur is employed as an article of commerce, the bluish or lead-coloured

variety being most esteemed. In the peculiar dialect of the American Cree Indians, this animal rejoices in the unutterably euphonious name of *Wappeekeshew-makkesheew!*

THE INDIAN FOX (*Vulpes Bengalensis*).—This is a small and elegant species, having a brownish fur, which is much darker along the middle line of the back, forming a longitudinal sooty-coloured band; the tail is also tipped with black, and the species is further distinguished by the presence of circular patches of white round the eyes. According to the experienced testimony of Captain Williamson, these foxes are extremely numerous in India. In general their earths are placed on rising grounds, to prevent their being inundated. The holes are "remarkably small, and may be opened in an hour by any common labourer. The foxes are very cunning, at least as much so as their brethren in Europe. I have several times known them, when pushed hard by greyhounds, to conceal themselves in rice fields, or among bulrushes, &c., with only their noses peeping out of the water. On such occasions, unless there be some questing dog at hand, Reynard will often escape unnoticed. Both jackals and foxes sham death to admiration. After having been almost pulled to pieces by dogs, and left to all appearance lifeless, they sometimes gradually cock their ears, then look askance at the retiring enemy, and, when they think themselves unobserved, steal under a bank, &c., and thus skulk along till they find themselves safe, when, setting off at a trot or canter, they make the best of their way to some place of security." The Indian fox feeds principally on small birds and quadrupeds, especially rats, mice, and such like vermin; he is likewise partial to fowls, poultry, and game, but to secure them he rarely ventures within the walls of any village or town.

THE JACKAL (*Canis aureus*)—Plate 8, fig. 27—differs from the fox, in presenting a more dog-like appearance. The fur exhibits a ruddy yellowish-grey colour generally, being darker on the back, where it is almost black. The throat and under parts of the belly are much lighter. The ocular pupils are rounded, as in dogs. The common Jackal is widely distributed throughout eastern countries, being found in abundance in Hindoostan, Persia, Tartary, the Caucasus, Dalmatia, the Morea, Palestine, Egypt, and North Africa, as far as the coast of Guinea. In respect of size it is intermediate between the fox and the wolf. Its habits are gregarious; it hunts at night in packs, and, from its piercing yells and destructive habits, is everywhere regarded with horror. The united cry of a pack produces a most unearthly sound, which has been compared to the distant rolling of thunder. Captain Williamson records many facts which clearly prove that jackals will combine to defend or rescue one of their number. Among these he mentions the following incidents:—"Mr. Kinloch, who was well known as an excellent sportsman, and who, when at Midnapore, kept a famous pack of hounds, having one morning chased a jackal, which entered a thick jungle, found himself under the necessity of calling off his dogs, in consequence of an immense herd of jackals which had suddenly collected on hearing the cries of their brother, which the hounds

were worrying. They were so numerous that not only the dogs were defeated, but the jackals absolutely rushed out of the cover in pursuit of them; and when Mr. Kinloch and his party rode up to whip them off, their horses were bit, and it was not without difficulty a retreat was effected. The pack was found to have suffered so severely, as not to be able to take the field for many weeks." The same writer speaks of the Jackal as an extremely troublesome customer. He is exceedingly vigilant, and seldom fails to carry his purpose. In spite of your efforts to scare him away, even with the aid of fire-arms, he will perseveringly "wait at your door, nay, will enter your house, and avail himself of the smallest opening for enterprise; he will rob your roost, and steal kids, lambs, pigs, and sometimes even take a pup from its sleepy mother; he will strip a larder, or pick the bones of a carcase—all with equal avidity. It is curious to see them fighting almost within reach of your stick, for proximity to expected booty. It may readily be supposed that when any meat or poultry is purloined by servants, the Jackal bears the blame. An officer in our battalion in one night lost twenty-seven fowls from the hut in which they were kept; on which one of his servants did not hesitate to declare that, on hearing their uproar during the night, he had run to see what was the matter, and saw twenty-seven jackals, each bearing away his bird!" Jackals, as we have seen, will devour any kind of offal, and it is credibly stated that they will dig up and greedily feed upon the half-buried corpses of a battle-field. The odour of the Jackal is very offensive, but it appears to wear off in the domesticated animal. The matter which gives rise to the disagreeable smell is secreted by a gland at the base of the tail. This dermal or skin gland was at one time supposed to exist only in the foxes, until a distinguished comparative anatomist—Professor Retzius, of Stockholm—showed that this organ occurs in wolves and jackals also. It is not necessary to place the slightest reliance in the old story about jackals acting as purveyors to the lion, there being no sufficient grounds for such a notion.

THE WOLF (*Canis lupus*), Plate 7, fig. 24.—Probably no wild animal is more dreaded in civilized countries than the common Wolf, its ferocity and strength having very often proved disastrous to the traveller, and to the residents of outlying villages. Its general appearance is too well known to require any lengthened description. The body is about four feet long, exclusive of the tail, which measures from fourteen to eighteen inches, according to circumstances. The straight direction and dependent position of this organ has been considered as a character sufficiently important to distinguish the wolf from the dog; but when those who argue for the specific distinctness of the two animals are thus obliged to resort to such trifling characters, it shows the very slender nature of the grounds on which their arguments are based. Without regarding the point in dispute as entirely decided, we strongly adhere to the view of Professor Owen and others, who regard all kinds of dogs as domesticated varieties of the wolf. The fur of the Wolf is long, especially on the throat and below the ears; its texture rough, wiry,

and harsh. Ordinarily it is of a yellowish-grey colour, being much lighter beneath the neck and belly. Some varieties are dark, almost pure black. In northern regions the fur becomes light-coloured during the winter, and is very frequently quite white; yellow and pied varieties have also been described. There are indeed many wolves differing very markedly in size and colour, and it is quite impossible to determine accurately how many of them represent distinct species. Even if this were the proper place to discuss the matter, our space would not allow a full and complete discussion of the subject. The black variety is very common in the south of Europe, especially on the Spanish side of the Pyrenees. They are very large, tall, and strong in that quarter, and their habits are excessively crafty. Colonel Hamilton Smith says, that they formerly congregated "in the passes of the Pyrenees in large troops; and even now the Lobo will accompany strings of mules as soon as it becomes dusky. They are seen bounding from bush to bush by the side of travellers, and keeping parallel with them as they proceed, waiting an opportunity to select a victim, and often succeeding, unless the muleteers can reach some place of safety before dark, and have no dangerous passes to traverse." These black wolves are likewise to be found in the mountain slopes of Friuli and in the neighbourhood of Cattaro. The common grey variety is very widely distributed, occurring in various parts of Europe, Asia, Africa, and North America. In early historic times it roamed at large in the forests of Great Britain, as abundantly, perhaps, as it now occurs in some districts of France, Hungary, Russia, Norway, and Sweden. Their rapacity is much increased during the winter months, especially if the cold season prove unusually severe and protracted, when the supply of food necessarily becomes limited. On these occasions their depredations prove most disastrous. Thus, Dr. Weissenborn informs us, that in one severe winter on the continent, they became remarkably bold and violent. About the middle of the month of January large numbers infested the neighbourhood of Stuttgard, where they succeeded in capturing a poor lad, twelve years of age, only a few miles outside the city. At night they prowled about in packs; and one batch of them, ten in number, having forced their way into a farmyard near Agram, they committed most serious havoc among the cattle. Many crossed over into Prussia from the Polish frontiers, and a solitary individual deliberately attacked a horse in one of the busiest and principal streets in the city of Königsberg. Many other instances have been given of their daring under the extremities of famine. The most horrible account is that recorded by Captain Williamson in Northern India. On this occasion their want of food was not the result of cold, but it was owing to the extreme drought of the year 1783, which caused a dreadful scarcity of all kinds of food and animals during the ensuing season. This famine was especially felt in the fertile province of Oude. Thousands of the natives, we are told, perished from starvation, "while numbers fell an easy prey to the wolves, which, being bereft of their usual means of subsistence by the general destruction of all eatable animals, were at first compelled, and afterwards found it convenient.

to attack the wretched wanderers. The little resistance they experienced in their depredations on these unfortunate creatures, emboldened them in an astonishing manner, and taught them to look with contempt and defiance towards a race, of whose powers they had heretofore been in awe. Such numbers, however, succeeded in finding their way to the cantonments, that we were to all intents in a state of siege. The wolves followed, and were to be seen in all directions committing havoc among the dying crowd." Here we have indeed a sad picture; for the very loss of food these animals experienced by the general scarcity of other creatures, was more than amply compensated to them by the abundance of perishing men, women, and children. For the latter, indeed, the Wolf has a remarkable propensity at all times. The same writer declares that "his favourite object is a child at the breast, which, when opportunity serves, he seizes by the throat, thereby not only preventing it from giving the alarm by its cries, but taking a hold such as enables him to bear away his prize without impeding his progress." Very few children, even if timely rescued, survive this trenchant grip. On another occasion two wolves gained access to a bungalow near Cawnpore, where they seized a lad thirteen years old, precisely in the same manner; death having ensued, they were in the act of ingeniously raising the body over a wall, when the fall of a tile aroused the sleeping parents, who hurried to the spot, from whence the brutes scampered off leaving the victim of their cunning a ghastly spectacle. About this time the wolves in the northern districts became so familiarized with man, by what had happened during the famine, that they very frequently attacked adults and even armed persons. Ordinarily, however, as we have before remarked, the Wolf is a great coward. Sir John Richardson testifies to the same behaviour in the case of the American wolf, which is probably a mere variety of the common grey species. He states that if these wolves were not as fearful as they are rapacious, the American buffalo-hunters would be unable to preserve their game. "The simple precaution of tying a handkerchief to a branch, or of blowing up a bladder, and hanging it so as to wave in the wind, is sufficient to keep herds of wolves at a distance." Sir John Richardson also mentions an instance where a poor Indian woman was killed by a wolf, within sight of her husband, who was coming to rescue her; and it is particularly worthy of notice, that in this instance the neck was the part of the body seized. In the higher northern latitudes many wolves perish during the cold season from inanition; and in some cases, when the winter has been unusually severe and prolonged, they perish by hundreds. Some voyagers tell us that they have both seen and heard the poor animals—for under these circumstances we feel inclined to pity them—howling painfully as they lay stretched and famishing on blocks of ice. To these they have resorted in the hope of catching seals and other marine animals, and while thus employed, the ice-fields have become detached and have drifted away into the open sea. The Wolf, like the fox, forms burrows or earths; into these they retreat during the day, and likewise occupy them for the special purpose of rearing their young.

The number of cubs produced at a birth seems liable to vary, there being usually four or five; but in the case of the American variety, Sir John Richardson states that eight or nine are sometimes the result of a single litter. A very effectual manner of extirpating wolves is by smoking them out of their earths. This plan, adopted in India, is extremely simple. All that is necessary, is to be provided with a quantity of sticks, straw, and lucifer matches, and a few pounds of brimstone. There are generally several outlets to each earth; but it is not necessary to make a fire before many of these, especially if the party be well provided with fire-arms. Usually it is not considered desirable to give any of them the slightest chance of escape; but, under any circumstances, it is advisable to fire the lower holes, so as to allow of the fumes being drawn in by a strong current of air. The death of the savage tenant is usually very painful, and long before he comes to the surface, his commencing distress and agony is indicated by a painful moaning. Sometimes they rush out; but being more or less stupified by the fumes, they seldom make their escape. If they avoid the spears and clubs of the natives, who are anxiously watching outside, the gun, rifle, or arrow, more surely effects the purpose of their destruction. In the foregoing remarks we have repeatedly had occasion to point out instances of the cunning and ingenuity of the Wolf; but we cannot entirely quit our account of this animal without quoting another interesting illustration of its craftiness. Mr. Lloyd, in his "Scandinavian Adventures," thus writes:—"At one time, indeed, I had serious thoughts of training a fine female wolf in my possession as a pointer; but I was deterred, owing to the *penchant* she exhibited for the neighbours' pigs. She was chained in a little inclosure, just in front of my window, into which those animals, when the gate happened to be left open, ordinarily found their way. The devices the wolf employed to get them in her power were very amusing. When she saw a pig in the vicinity of her kennel, she, evidently with the purpose of putting him off his guard, would throw herself on her side or back, wag her tail most lovingly, and look innocence personified. And this amiable demeanour would continue until the grunter was beguiled within the length of her tether, when, in the twinkling of an eye, the prey was clutched." Whilst she was young she contented herself with the tail; but after she had realized her full powers, the unsuspecting swine were snapped up bodily, and, on such occasions, Mr. Lloyd found it a difficult matter to rescue them from her jaws.

THE RED WOLF (*Canis jubata*).—This is a well-marked form, inhabiting the marshy districts of South America. The fur has a fine cinnamon-red colour, which imparts to the species a very attractive appearance. The terminal moiety of the tail is white, and there is also a white spot under the head. The Red wolf is further distinguished by a short black mane, commencing at the occiput, and proceeding downwards along the middle line of the back. According to D'Azara, as quoted by Ogilby, these animals "do not commit havoc on the herds or smaller flocks; and as they inhabit only the extensive lowlands and marshes of Paraguay as far as the river Plata, and near its mouth, he has no

doubt that they feed on rats, guinea pigs, small birds, and certain vegetables, if these fall in their way, but chiefly on snails, toads, frogs, and other reptiles, and on the land crabs, which are abundant in the plains and sand-banks. They walk with very long paces, run much, and are, D'Azara adds, great plunderers, although they always fly from man, and even from dogs. They are solitary in their habits, are said to swim well, and in their wild state to utter no sound but *gouaa*, which they often and loudly repeat, so as to be heard at a great distance." The Payaguas Indians call the Red wolf *Parapaga*; it is termed *Culpeu* by the natives of Chili. It is also known as the Aguara, a name likewise applied to a distinct race of wild dogs.

THE DOG (*Canis lupus* var. *familiaris*).—We do not specifically recognize the dog as a distinct animal, and have previously expressed our adhesion to the view that these useful creatures are neither more nor less than domesticated varieties of the common wolf. The natural history of the Dog is a subject of considerable interest; but it is one so extended that the bare enumeration of the leading characteristics and habits of the principal varieties, would require an entire volume for their description and elucidation. Those, therefore, who wish to follow up this department of the subject, must consult works specially devoted to dogs. Some of the numerous canine varieties attain a very great size, with a proportionate degree of strength; such, for

example, as the Bloodhound, the Mastiff, the Newfoundland, and the Thibet dog (Plate 6, fig. 23); others are remarkably small, as in certain varieties of Spaniel; while a third kind are extremely attenuated both in shape and make, as instanced by the little Italian Greyhound. In many parts of the world, dogs have returned, at least to a certain extent, to their original wild condition. In this way they have formed several quite distinct races or typical varieties, which are found in different parts of Asia, Australia, and the two Americas. From a general consideration of these forms, it may be fairly stated that, both in structure and appearance, they exhibit a much closer approximation to the common wolf than obtains in the case of any of the varieties which have remained domesticated. (For a full and able exposition of this subject, however, we must refer our readers to Mr. Bell's work on "British Quadrupeds," and particularly, also, to the early part of Dr. Carpenter's admirable article entitled "Varieties of Mankind," contained in the 4th volume of Dr. Todd's "Cyclopedia of Anatomy and Physiology.") The Australian wild dog or Dingo, fig. 30, approaches so closely to the wolf, that it was described by Bewick as the "New South Wales wolf." The Indian Dhole is another interesting example of a return to the wild state. In some respects it comes nearer the jackal. The fur is of a bay or rufous-brown colour; the tail being long and narrow, and not bushy at the extremity. It has a remarkably bright eye, and

Fig. 30.



Dingo, The Wild Dog of Australia.

a keen lively countenance. Though strictly wild and savage, it will not attack persons unless first molested. These Dholes live almost entirely upon other animals, especially deer, which they hunt in large packs; authentic instances are also recorded where they have attacked and overcome tigers. Some have doubted this, but the evidence is complete; and, besides, there can be nothing improbable in the circumstance of wild dogs attacking tigers, when it is a well-known fact that common spaniels will readily do the same thing; many a life,

indeed, has been spared by the courage of the latter. When engaged in the chase or on the scent the Dholes do not howl or bark, but, at times of much excitement in the course, they utter a kind of plaintive whining note. Among other kinds of wild dogs which are more or less closely allied to the wolf, we may perhaps class the Caygote or Coyote, whose fur has a whitish-brown colour. This animal is an inhabitant of South America, and feeds upon small quadrupeds, and also upon maize and other vegetable matters.

FAMILY VI.—FELIDÆ.

Having in our introductory observations on the Carnivora selected examples of the present family for the purpose of enunciating the leading characteristics of the order—mainly on account of its forming the most typical subdivision of that great mammalian group—the observations which we have now to offer must necessarily assume a supplementary character. In the remarks above alluded to, attention was drawn to the general massiveness of all the osseous elements entering into the solid framework of the typical carnivorous skeleton—this adaptation to the destructive habits of the creature being more particularly conspicuous in the structure of the skull. In the accompanying representation of the cranium of a tiger—fig. 31—the remarkable shortening of the facial bones, associated with the powerful

Fig. 31.



Skull of the Tiger.

grasping teeth, and a surprising transverse breadth of the skull below the orbital and temporal fossæ, are remarkably significant. The teeth are thirty in number, and of these we find only four true and ten spurious molars, the ultimate grinder on either side of the upper series being tuberculated. This tooth, however, is particularly small, and widened laterally; but, with this exception, all the molars are much compressed from side to side, and the crowns being sharp and pointed, the two series, during the action of the jaws, close in upon each other like the blades of a pair of scissors. Their function is therefore essentially cutting, while that of the huge dagger-like canines, assisted by the incisors, consists in tearing and lacerating—the due performance and integrity of these actions being secured by the strong temporal and nuchal muscles acting upon the occiput and the lower jaw; and farther, to prevent any lateral motion, such as we find in those animals which grind and triturate their food, the condyles or articulating facets of the last-named bone are firmly lodged in the corresponding transversely-elongated glenoid sockets. Co-ordinating with this prehensile and offensive armature of the jaws, we also find the structural modifications of the feet eminently suggestive. Those of the anterior limbs are pentadactylous, while the posterior feet are tetradactylous; but the peculiarities which principally distinguish them arise out of the beautiful provision made for the preservation of their formidable retractile claws. The mechanical contrivances here displayed are perfect. Not only are the actions of flexion, extension, pronation, and supination amply provided for by the peculiar

manner in which the bones of the fore limb or arm are articulated together, but the muscles of this member are so prodigiously developed, that, as is well known, a single blow from the sledge-hammer like paw of a lion or tiger will fracture the skull of a man, and deal death to almost any animal that may happen to come within its ponderous swing. In addition to this, we find the claws ordinarily maintained in a state of retraction; this concealed position is accomplished by the agency of three elastic ligaments or bands, which being severally placed above and on either side of the digit, serve to connect the ultimate phalanx to the penultimate segment of the same toe (fig. 32). All injury to the claw is hereby prevented—a circumstance which, associated with the presence of resilient sole-pads of thickened submucons tissue placed under the ball of the toe, also serves to secure the characteristically graceful and noiseless tread of the feline animal. Antagonistic to the elastic binding cords above mentioned, the tendon or string of a large muscle called the flexor profundus perforans is inserted below, into the base of the ultimate claw-supporting phalanx. When, therefore, it becomes necessary to display or employ these fearful instruments of destruction, a violent contraction of the muscle

Fig. 32.



Lion's Foot dissected.

in question—which of course involves a drawing back of the tendon, and a consequent thrusting forward of the claw—is the principal agency by which this change is effected. There are likewise other small extensor muscles inserted at the upper part of the digit, serving to steady the movement and regulate the degree of protrusion, according to the will of the animal. But, we have further to remark, that, although these constitute the most prominent features in the several structural changes adapted to the wants and habits of the feline mammalia, there are others equally worthy of being mentioned, such as the strong, horny, recurved papillæ of the tongue, formed for rasping the soft flesh from off the bones of their slaughtered victims—the comparatively small salivary glands, showing how little mastication is required—the uninterrupted chain of osseous elements extending from the larynx to the head—the flexibility of the vertebral column—the small cæcum—the shortness of the intestinal canal, and, more particularly, the simple cylindrical stomach, which explains that the food is more readily reduced to the condition required for nutriment, than obtains in the herbivorous quadrupeds. Do not these, and other peculiarities elsewhere noticed, satisfactorily demonstrate that the typical carnivore is intended to occupy the field in the economy of creation for which his powers are so befittingly adapted? Surely one would suppose that the legitimacy of such a self-evident conclusion could not be denied! Are we perverting truth to say, that the lion was not formed to eat straw like an ox? Unfortunately, there

are some so-called educated people who would fain persuade us that we are wrong! It is sad to reflect that some persons can be found who will thus resist the evidence of their senses, in order to gratify a childish crotchet, or to support a pre-conceived dogma! Those of our readers who have perused the address issued previous to the publication of this part of the "Museum of Natural History," will appreciate the motive which thus leads us to offer a few reflections on the habits of this highly interesting class of animals. Not many years ago the writer of this article had the misfortune to be present at a lecture given in the northern metropolis, by a gentleman whose mind appeared to be singularly ill-adapted for the reception of scientific truth, but whose perverted views, nevertheless, enjoy a certain credence among individuals capable of indulging extreme opinions. Thus, he undertook to inform his audience that the several organs of a carnivorous animal, in which we have been accustomed to recognize teleologic evidences of beauty, harmony, and design, have all been diverted from their proper development by an evil agency—that the claws, teeth, and stomach, which we have just shown to be severally adapted to the seizure, tearing, and digesting of the flesh of other animals, do not, indeed, exhibit evidences of design, benevolence, and wisdom in the Creator, but rather, evidences of another power, which has caused the anterior extremity to become a hideous weapon of destruction—which has caused those teeth to display their tearing and cutting surfaces—which has caused the stomach to assume a vicarious action; all of these organs severally contributing to render the creature ferocious, cruel, and destructive—habits, which, in this anti-zoologist's view, the animal was not intended to have! Such is an illustration of the melancholy inferences to which unscientific dogmatism inevitably leads—a mere bigoted mimicry of mediæval times! For the successful cultivation of natural-history science it is above all things necessary that our minds be imbued with a love of truth, in whatever aspect it may present itself. If we perceive that the integrity of organized existences on this planet can only be maintained by the reciprocal action of antagonistic forces, and that the balance of this reciprocity involves and guarantees the welfare of every living entity, needing a residence on the habitable globe; if, we repeat, it is clearly evident that any departure from this divinely-appointed law would, on the one hand, only bring about a redundancy, or, on the other, a deterioration; what, we ask, is to be gained by impertinently criticising this universal law, this wise method of divine government, fixed on the eternal principles of justice, equity, and compensation? In the nicely-adjusted balance of probabilities we recognize abundant good to all living beings whose immediate wants are thus duly provided for, and we are content to admire and adore the power which regulates the destiny of every species. In conclusion, we have only to observe that the *Felidæ* are widely distributed in all quarters of the world, except in Australia, the larger species being, for the most part, confined to tropical regions.

THE WILD CAT (*Felis Catus*), is more or less abundant throughout the well-wooded and hilly districts of

Europe, and was at one time very plentiful in these islands. It is still found in Wales, in the north-west counties of England, and more commonly in Scotland, and certain parts of Ireland. It is not quite two feet long, exclusive of the tail, which measures about twelve inches. The body is stouter than in the common house cat, the tail presenting an almost uniform thickness from one end to the other, except at the tip, where it is slightly swollen. The fur has a yellowish-grey colour generally, but beneath the throat and belly it is nearly white; the sides of the body, the legs, the tail, and summit of the head being striped with brownish-black bands, which becomes lighter as they approach the ventral line. A longitudinal black band runs along the middle of the back, extending from the head to the root of the tail; this last named organ being black at the tip. The wild cat was formerly considered in England a beast of the chase, but, except for mere sport, it does not appear to have been considered of any great value. It is reported, by those who have seen it in its wild haunts, to be extremely ferocious, a circumstance which has doubtless contributed to bring about its almost total extinction. The female produces four or five cubs at a birth, and selects either a hollow tree, a rocky recess, or, according to Sir William Jardine, a large bird's nest, for the protection and rearing of the young.

THE DOMESTIC CAT (*Felis domestica*).—The concurring testimony of the majority of British naturalists favours the notion that our common house cat is a distinct species, or, at least, that it is not a mere domesticated variety of the European wild cat. It is well known that the common cat frequently betakes itself to the woods, and after a time assumes a semi-savage condition. This was at first considered sufficient ground for believing it to be identical with *Felis Catus*; but when, on a closer examination, its characters were not found to have reverted to the state of those ordinarily present in the wild species, considerable doubt arose on the question. The colour of the fur is frequently indistinguishable, but a very marked dissimilarity is seen in the tail, which, instead of being uniformly thick throughout, as obtains in the wild cat, is, in the form under consideration, much narrower and tapering also toward the extremity. Sir William Jardine has made some very interesting remarks on this subject. He says there is probably "no animal that so soon loses its cultivation and returns apparently to a state completely wild. A trifling neglect of proper feeding or attention will often cause them to depend upon their own resources, and the tasting of some wild or living food will tempt them to seek it again, and to leave their civilized home. They then prowl about in the same manner as their congeners, crouching among cover, and carefully concealing themselves from all publicity. They breed in the woods or thickets, and support themselves upon birds or young animals. Few extensive rabbit-warrens want two or three depredators of this kind, where they commit great havoc, particularly among the young in summer. They sleep and repose in the holes, and are often taken in the snares set for their prey." Sir W. Jardine once stumbled upon one of these truants which had just kittenened, and

by her side there lay two dead leverets! In the ordinary domesticated condition, the cat is certainly of a capricious disposition, but its habits are too well known to demand any lengthened exposition.

THE ÆGYPTIAN CAT (*Felis maniculata*).—The Frankfort naturalist, Rüppell, who discovered this species during his travels in Nubia, has expressed his opinion that our common domestic cat owes its origin to this species. Temminck and others have supported this persuasion, and authorities are still divided on the subject. After weighing the arguments on either side, all that we can say, is, that there appears more probability of our tame animals having descended from the Ægyptian, than from the European wild form; but the matter is by no means settled. In the Ægyptian cat the limbs are more slender, while the tail is narrower and longer than in *Felis Catus*. The fur is greyish-yellow generally; the cheek, throat, under part of the throat, and belly being white. A dark stripe runs along the central line of the back, and the limbs are crossed by several faint blackish bands. The length of the body is about twenty inches, exclusive of the tail, which measures three-quarters of a foot.

THE PAMPAS CAT (*Felis pajeros*).—This species is extensively distributed over the South American plains, from the banks of the La Plata to the Straits of Magellan. It is about the size of the European wild cat, measuring twenty-six inches, exclusive of the tail, which is about a foot from root to tip. The fur is particularly long, the individual hairs being from three to five inches in length; it is of a pale yellowish-grey colour generally, and banded at the sides by numerous irregularly-disposed stripes of a brownish tinge. Along the central line of the back the hairs have a brownish-black colour, which is more or less continued on the tail. The head is comparatively small and rounded, the ears having a moderate development. The tail is short, thick, and rather bushy; but it does not exhibit any circular markings or spots. According to D'Azara, the natives call it *Gato Pajero*, or jungle cat. It is said to feed chiefly upon guinea-pigs.

THE CHATI (*Felis mitis*) is somewhat larger than our common domestic cat, measuring three feet including the tail, for which eleven inches may be reckoned. The fur displays a multitude of irregularly arranged dark-brown patches on a general ground colour of pale yellow above, and white below; on the limbs these spots are more rounded, and there are two crescent-shaped collar-like bands beneath the throat. The ears are blackish externally; the pupil of the eye is rounded. The tail is slightly ringed towards the tip. Like the foregoing, the Chati is an inhabitant of the plains of South America. The female preserved in the Parisian menagerie, was extremely gentle and fond of attention.

THE CHIBIGUAZU (*Felis chibiguazu*) is also a South American animal, being rather larger than the above, and measuring, according to D'Azara, four feet including the tail, which is about thirteen inches long. Some regard it as identical with the chati, others refer it to the ocelot; probably it is distinct. It is exceedingly cunning and destructive in its habits; approaching and entering human habitations only in the darkest nights, and then, not content with carrying off as much

poultry as it can manage, it destroys others that have been left behind. If taken young it becomes very tractable and amusing, but if allowed much liberty it soon displays its fowl-destroying propensities.

THE SERVAL (*Felis serval*) is a native of southern Africa, and is called the *Tiger boschkatti* by the Dutch colonists at the Cape. By others it is called the leopard. According to Mr. Andersson some of the African tribes believe the real tiger to exist in that country, but it is evident that they refer to the serval. This animal is remarkably savage. "One night," says Mr. Andersson, "I was suddenly awoken by a furious barking of our dogs, accompanied by cries of distress. Suspecting that some beast of prey had seized upon one of them, I leaped, undressed, out of my bed, and, gun in hand, hurried to the spot whence the cries proceeded. The night was pitchy dark, however, and I could distinguish nothing; yet, in the hope of frightening the intruder away, I shouted at the top of my voice. In a few moments a torch was lighted, and we then discovered the tracks of a leopard, and also large patches of blood. On counting the dogs, I found that 'Summer,' the best and fleetest of our kennel, was missing. As it was in vain that I called and searched for him, I concluded that the tiger had carried him away; and, as nothing further could be done that night, I again retired to rest, but the fate of the poor animal continued to haunt me, and drove sleep away. I had seated myself on the front chest of the waggon, when suddenly the melancholy cries were repeated; and, on reaching the spot, I discovered 'Summer' stretched at full length in the middle of a bush. Though the poor creature had several deep wounds about his throat and chest, he at once recognized me, and, wagging his tail, looked wistfully in my face. The sight sickened me as I carried him into the house, where, in time, however, he recovered." It is also satisfactory to learn that the savage animal was found on the day succeeding the encounter. On being discovered the beast took refuge in a tree, and was not dispatched before it had received sixteen wounds, some of the arrows employed for this purpose having been poisoned. In Dr. Gray's arrangement of the Felidæ contained in the British Museum, this species is denominated *Leopardus serval*.

THE NEPAULESE CAT (*Felis Nepalensis*).—In the list of feline mammalia preserved in our National Museum, this species is called the waved cat or *Felis inconspicua*, and it is believed by Dr. Gray to be identical with the Bengal cat. Dr. Horsfield considers these forms to be distinct. The body is scarcely two feet long, exclusive of the tail, for which another ten or eleven inches must be allowed. The general colour of the fur is that of a tawny-grey, the surface being marked with spots and linear patches of a deep-black colour, somewhat irregularly disposed. The throat and under part of the belly are whitish; the spots on the tail being uniform, rounded, and arranged so as to resemble transverse bands.

THE KUWUK (*Felis Javanensis*) is also a small species, principally distinguished by its comparatively short tail and rather long legs; it is also only provided with three molars on either side of each jaw. The body

is twenty-three inches in length, not including the tail, which measures between eight and nine inches. The fur has a greyish-brown colour generally, the under part of the throat, neck, and belly being nearly white; it is long, and of a softish texture. Four dark brownish-black bands pass from the crown of the head to the root of the tail, while the sides of the body are marked by sparsely-scattered oblong patches of a similar colour; having a tendency to assume a linear arrangement. Similar spots occur on the limbs and tail. The eyes are placed well forward, and have a circular pupil. The ears are small and rounded. According to Dr. Horsfield the "Kiwuk is found in large forests in every part of Java. It forms a retreat in hollow trees, where it remains during the day; at night it ranges about in quest of food, and often visits the villages at the skirts of the forests, committing depredations among the hen-roosts. The natives ascribe to it an uncommon

sagacity, asserting that in order to approach the fowls unsuspected, and to surprise them, it imitates their voice. It feeds chiefly on fowls, birds, and small quadrupeds; but, in case of necessity, it also devours carrion." It is, we are further informed, a very fierce and untameable animal. In the British Museum list of preserved specimens, it is designated *Leopardus Javanensis*.

THE BULU (*Felis Sumatrana*).—As far as regards size, the comparative shortness of the tail, the length of the limbs, and in the disposition of its spotted markings, this species very closely resembles the foregoing. According to Horsfield, the general ground colour of the fur "is ferruginous, inclining to yellowish-grey, more intense on the back, the crown of the head, and the upper part of the tail; paler on the sides, and passing into whitish-grey on the cheeks, breast, abdomen, and the interior of the thighs and legs." The Bulu (fig. 33) is an inhabitant of Sumatra, Java, and the contiguous

Fig. 33.

The Bulu (*Felis Sumatrana*).

islands. In the list of specimens preserved in our National Museum, it is also associated with the leopards.

THE OCELOT (*Felis pardalis*) inhabits the forests of tropical America, and is an attractive-looking species. The body is about three feet in length, exclusive of the tail, which measures from twelve to fourteen inches. The general colour of the fur is fulvous-grey, the inferior parts of the throat, neck, and belly being nearly white. The entire surface is beautifully streaked with irregularly shaped patches of a black colour; these spots having a marked tendency to form longitudinal bands, especially at the upper part of the body. The ears are small and rounded, the limbs comparatively short. Respecting its habits, the Ocelot is a good climber, and is said to sham a state of death in order to capture monkeys, whose curiosity leads them to approach and inspect the simulating carcass. It is capable of being tamed, but, like others of the cat tribe, its disposition is capricious. Mr. Blyth mentions an instance where "a gentleman had succeeded in taming an ocelot, which for three years, enjoyed the range of his house

and garden as freely as a domestic cat, appearing thoroughly reclaimed. One evening, however, at the fireside, when a child of three years old was playing with it, as it had often done before, the animal being irritated, seized the infant by the throat, and killed it before assistance could be rendered." In the British Museum's list, this animal is classed with the leopards.

THE CHAUS (*Felis Chaus*) is a kind of Lynx. It has a wide geographical distribution, inhabiting Egypt, Persia, the borders of the Caspian, and also many parts of central and northern India. It is chiefly found in low marshy grounds and jungles, where it preys upon small quadrupeds and birds, and also, according to Riippell, on fishes. The fur is comparatively long, loose, soft, and of a yellowish-grey colour. The tail is short, thick, and indistinctly marked by four or five alternating black and greyish-white bands. These occur towards the extremity, which terminates somewhat abruptly. In common with other allied forms, the ears are much pointed, being tufted at the summit by a pencil of fine black hairs, half an inch in

length. The *Chaus* is not very easily tamed. The Booted lynx—*Felis caligata* of Olivier—appears to be identical with it. In the catalogue of specimens preserved in the British Museum it is designated *Chaus Lybicus*.

THE EUROPEAN LYNX (*Felis Lynx*).—There are several forms of Lynx, regarded by some as so many distinct species, which are only varieties of this type. Among these may be mentioned the *Felis virgata* of Nilsson; the *F. cervaria* of Temminck, being an Asiatic form; and perhaps also the *F. pardina* of Oken, found in Spain and southern Europe. The European lynx is about three feet long, not including the short tail, which measures six inches. The fur is long, rough, and of a rufous-grey colour above, the under parts of the throat and belly being more or less white. The sides are indistinctly marked with oblong spots, and the free end of the tail is tipped with black. The ears are hairy, and pencilled at the upper part; the limbs stout, and comparatively short. During the winter season the general colour of the fur is much lighter than in summer, while it is also considerably longer. The European lynx is a good climber, feeding principally on small mammalia and birds.

THE CANADA LYNX (*Felis Canadensis*) was formerly supposed to be only a variety of the above, but it is now generally believed to be distinct. In respect of size, colouring, and other characters of the fur, it very closely resembles the European species. The body is rather more than three feet in length, exclusive of the tail, which measures only four and a half inches. For an accurate account of this animal's habits we are indebted to Sir John Richardson, who remarks that "it is a timid creature, incapable of attacking any of the larger quadrupeds; but well armed for the capture of the American hare, on which it chiefly preys. Its large paws, slender loins, and long but thick hind legs, with large buttocks, scarcely relieved by a short thick tail, give it an awkward, clumsy appearance. It makes a poor fight when it is surprised by a hunter in a tree; for though it spits like a cat, and sets its hair up, it is easily destroyed by a blow on the back with a slender stick, and it never attacks a man. Its gait is by bounds, straightforward, with the back a little arched, and lighting on all the feet at once. It swims well, and will cross the arm of a lake two miles wide; but it is not swift on land. It breeds once a year, and has two young at a time." We are further informed that the natives eat its flesh, and that from seven to nine thousand skins are annually exported by the Hudson's Bay Company. In Dr. Gray's catalogue this species is designated *Lynx Canadensis*.

THE CARACAL (*Felis Caracal*) is also a kind of lynx, having a wide geographical range, and extending not only over Africa, but, according to Mr. Bennett and others, over southern Asia, as far eastward as the Ganges. The body is about thirty-four inches in length, excluding the tail, which measures other nine inches. The fur exhibits a uniform rufous-brown colour generally, growing paler from above downwards, and becoming white immediately underneath the throat, neck, and belly. On each half of the face are placed two pure white spots, one being situated above and to

the inside of the eye, the other occurring beneath the outer angle of this organ. The ears are comparatively long, "tapering gradually to a fine tip, surmounted by a pencil of long black hairs," which are dark externally, and whitish within. Like other species of lynx, the Caracal is a good climber, and feeds chiefly on small mammalia and birds. It is said also to feed on the carcasses of larger quadrupeds, which have been forsaken by lions. The Caracal is proportionably strong, savage, and only tamed with difficulty. According to Mr. Andersson, the fur is much esteemed by the natives of southern Africa for making earosses, &c., while the Dutch settlers employ it as a local application in rheumatism. In Dr. Gray's list this species is termed *Caracal melanotis*.

THE OUNCE (*Felis Uncia*).—Since the naturalist Buffon gave an accurate description of this animal, some authorities have disputed its claims to be regarded as a separate species. It is, however, quite distinct, and in the language of Dr. Gray, "easily known by the thickness of its fur, the paleness of its colour, the irregular form of the spots, and especially by the great length and thickness of the tail." In the form of this last-named organ, we observe a wide departure from the peculiarly short stumpy condition of the tail in the lynxes; justifying perhaps, when taken into consideration with other minor characters, their generic separation—a view which several naturalists have practically adopted. The Ounce is about the size of the common leopard, and has similar habits. It is a native of the mountainous districts of central Asia. In the list of feline mammals presented in our national collection, it is denominated *Leopardus Uncia*.

THE LEOPARD (*Felis Leopardus*).—Most naturalists have arrived at the conclusion, that the Leopard and Panther are one and the same animal; we say arrived, but it would be more just to state, that they have finally acknowledged the opinion of Linnæus on this point to be correct, after having over and over again disputed his authority. The Leopard is truly a beautiful species (fig. 34). The ground colour of the fur has a pale yellow tint, the surface being marked at tolerably regular intervals by dark patches made up of numerous small round spots, blended together in the form of annulations surrounding a central clear space, the general tint within being deeper than the ground colour without. The Leopard is widely distributed in Africa, Asia, and the Indian Archipelago. Its habits are essentially cat-like, and, being an expert climber, the Indian natives call it the Tree-tiger or *Lackree bang*. Unlike the tiger, it is said that nothing will induce it to take to the water. Leopards are remarkably deceitful, shy, and ravenous, the utmost caution being necessary in any attempt to domesticate them. Their treacherous disposition has been illustrated in various ways, especially by Captain Williamson, who, amongst other things, relates the following incident:—"The adjutant of our regiment, wishing to send a leopard as a present to a friend in England, procured a very fine cub, which had scarcely opened its eyes, and took every pains to rear it in such a manner as might obviate all apprehension. For some months the animal appeared as innocent as a kitten, was playful, and seemed to be peculiarly tract-

able. I will not say how far its disposition might have continued unexceptionable under any other circumstances, but, unhappily, several of the privates of the artillery having access to the place where the leopard

was kept, and of course now and then imprudently worrying him, the leopard became snappish and petulant. One day a soldier provoked him rather too far, when the leopard, now grown to the size of a stout

Fig. 34.

The Leopard (*Felis Leopardus*).

pointer, suddenly reared, and fixing his claw in the nape of the man's neck, tore his shoulder in such a manner as to occasion the soldier's death in the course of a few hours. The leopard from that time became so ferocious as to render it absolutely necessary to shoot him—a measure which gave universal satisfaction."

THE CHEETAH (*Felis jubata*).—This is a species of very great importance in a zoological point of view, inasmuch as it has been represented as forming an aberrant transitional type between the dogs and cats; and but for the marked disparity in size, its general appearance, and the noble lion-like attitude which it assumes, we might perhaps have more reasonably considered it at the beginning of the feline series. Much has been written concerning its true zoological position, especially by Mr. Bennett, who is quite eloquent upon the subject; yet Professor Owen's detailed researches into the anatomy of this animal, clearly demonstrate that the so-called canine characters are more apparent than real. The body is much elongated, and stands high on the legs, which are correspondingly slim (fig. 35). The fur has a pale fulvous colour generally, being almost white beneath the neck and belly; and except in these situations, the entire surface is marked with numerous uniform and closely-set spots of a deep-black colour. The tail is long, and somewhat bushy at the tip, the central line beneath it, and the extremity, being white; but at the upper part and sides throughout the remainder of its extent, it is more or less annulated, the spots having a tendency to form incomplete transverse rings, which become more and more conspicuous as they approach the free extremity. The mane is very slightly

developed; the ears are short and rounded; the pupil of the eye is circular; the tip of the nose being black. The feet are provided with retractile claws, as in other Felidæ; but, according to Professor Owen, their action is somewhat restricted on account of the length of the unequal phalanges and their elastic ligaments. Some authors have erroneously stated that the claws are non-retractile. The Cheetah enjoys a wide geographical range over the open grounds of Africa and southern Asia. It is a singularly graceful and elegant species, and is very commonly known by the name of the Hunting leopard. In Persia it is called the *Youze*, and Mr. Ogilby tells us that "in the East, where these beautiful animals are employed in the chase, they are carried to the field in low cars, whereon they are chained. Each leopard is hooded. When the hunters come within view of a herd of antelopes, the leopard is unchained, his hood is removed, and the game is pointed out to him; for he is directed in the pursuit by his sight. Then he steals along cautiously and crouchingly, taking advantage of every means of masking his attack, till he has approached the herd unseen within killing distance, when he suddenly launches himself upon his quarry with five or six vigorous and rapid bounds, strangles it instantaneously, and drinks its blood. The huntsman now approaches the leopard, caresses him, wins him from his prey by placing the blood which he collects in a wooden ladle under the nose of the animal, or by throwing to him pieces of meat; and whilst he is thus kept quiet hoods him, leads him back to his car, and there chains him. If the leopard fails, in consequence of the herd having taken timely alarm, he attempts no pursuit, but returns to his car with a

dejected and mortified air." The Cheetah seems, therefore, quite capable of domestication. It exhibits a frankness of look, and an openness of manner, totally different from the sneaking distrustfulness of ordinary cats. Any one who has carefully watched the behav-

iour of the two beautiful specimens at present contained in the Zoological Society's Gardens, Regent's Park, cannot but have been struck with their playful freedom, gentle manners, and elegant attitudes; their habits entirely according with the favourable account given

Fig 35.

The Cheetah or Hunting Leopard (*Felis jubata*).

by Mr. Bennett of a similar pair formerly preserved in the Tower menagerie. In Dr. Gray's list this species is designated *Gueparda jubata*.

THE JAGUAR (*Felis Onca*) is a broad-chested, powerfully-built animal, inhabiting Central and South America (fig. 36). By some it is called the "great panther" or leopard. The body occasionally measures nearly five feet, exclusive of the tail. The fur is beautifully spotted, with annulations resembling those of the common leopard, their general appearance being, in the language of Mr. Bennett, at first sight "the same in both; but the open roses of the leopard are scarcely more than half the size of those of the jaguar, and they all inclose a space of one uniform colour, in which, unless in some rare and accidental instances, no central spots exist; while in the latter animal most of those which are arranged along the upper surface, near the middle line of the back, are distinguished by one or two small black spots inclosed within their circuit. The middle line itself is occupied in the leopard by open roses, intermixed with a few black spots of small size and roundish form; that of the jaguar, on the contrary, is marked by one or two regular longitudinal lines of broad, elongated, deep black patches, sometimes extending several inches in length, and occasionally forming an almost continuous band from between the shoulders to the tail. The black rings towards the tip of the latter are also more completely circular than in the leopard." Respecting the habits of the Jaguar, its ferocious and destructive character is well known;

devouring, as it does, with equal avidity, all kinds of cattle, horses, and other quadrupeds, monkeys, birds, fishes, and even reptiles, having, it is said, a true aldermanic relish for savoury turtle. Notwithstanding its fierceness, it is a cowardly animal, instances having been recorded where a loud shout has been sufficient to sear it away. The Spanish naturalist, D'Azara, gives an apt illustration of its great strength:—"A jaguar had struck down a horse, and D'Azara gave instructions that the latter should be drawn within musket shot of a tree wherein he intended to pass the night, in expectation that the jaguar would return for his prey. While D'Azara was gone to prepare himself, the jaguar returned from the opposite side of a broad and deep river, seized the horse in its mouth, drew it to the water some sixty paces, swam across the river with it, and drew it into a wood hard by." Both in form and colouring the Jaguar is prone to considerable variation, one of the kinds being of a deep brownish-black hue generally, so that the dark spots are scarcely rendered visible.

THE RIMAU-DYAN (*Felis macroscelis*) or Gigantic Tiger-eat of Sumatra, is a magnificent animal, and one of the handsomest of all the feline mammalia. The body is about three and a half feet long, exclusive of the tail, which would give us some three feet more. The fur has a brownish-grey colour, and is marked with marbled, interrupted, and angular patches of a deep velvet-black colour. In the 1st volume of the *Zoological Journal*, Sir Stamford Raffles gives the

following account of the habits of two half-tamed examples:—"Both specimens, while in a state of confinement, were remarkable for their good temper and playfulness; no domestic kitten could be more so; they were always courting intercourse with persons passing by, and in the expression of their countenance, which was always open and smiling, showed the greatest delight when noticed, throwing themselves on their backs, and delighting in being tickled and rubbed. On board the ship there was a small music dog, who used to play round the cage with the animal, and it was amusing to observe the playfulness and tenderness with which the latter came in contact with his inferior-

sized companion. When fed with a fowl that died, he seized the prey, and after sucking the blood and tearing it a little, he amused himself for hours in throwing it about, and jumping after it in the manner that a cat plays with a mouse before it is quite dead. He never seemed to look on man or children as prey, but as companions; and the natives assert that when wild, they live principally on poultry, birds, and the smaller kinds of deer. They are not found in numbers, and may be considered rather rare animals, even in the southern part of Sumatra. Both specimens were procured from the interior of Bencoolen, on the banks of the river of that name. They are generally found

Fig 36.

The Jaguar (*Felis Onca*).

in the vicinity of villages, and are not dreaded by the natives, except as far as they may destroy the poultry. The natives assert that they sleep and often lay wait for their prey on trees; and from this circumstance they derive the name of *Dahan*, which signifies the fork formed by the branch of a tree, across which they are said to rest and occasionally stretch themselves." The Rimau-dyau is identical with, and also known by the name of, the Clouded tiger. A fine living example exists in the Zoological Society's collection, Regent's Park.

THE TIGER (*Felis Tigris*)—Plate 8, fig. 29—is readily distinguished from all other feline mammalia by its large bulk, associated with the characteristic transverse bands which occupy all parts of the body. The stripes form rings on the tail, the tip being always black. On the inside of the limbs and under part of the belly the fur is white. In some examples there is more splitting of the bands than in others, forming what are

termed the double stripes. In all the tigers we have seen, this tendency was more or less marked. In the specimen called "Jungla," now exhibiting in this country, and formerly the property of the king of Oude, this variation is remarkably developed; but in other respects the much vaunted "fighting tiger" is not to be compared with the examples preserved in the Zoological Society's Gardens, Regent's Park. The Tiger is not furnished with a mane, and he stands less erect than the lion; his entire shape and make being more slender and graceful than that of his noble-looking congener. In regard to its geographical distribution, it is almost entirely confined to the great Indian peninsula and its adjacent islands, although it is also found in central and eastern Asia—in the latter region as far as Chinese Tartary. Early writers have celebrated in strong terms the ferocious and amazingly destructive habits of this animal; while its enormous strength, prodigious speed, and tremendous leaping powers, have over and

over again been only too faithfully illustrated by the disastrous records of its ravages, which have ever and anon appeared on the page of history. Cruel, insidious, bloodthirsty, and malevolent—such is the character it bears; but there are some who would fain modify the force of this charge, and defend the character, if not protect the life, of this fearful scourge of man and beast. The tiger is certainly a very cowardly animal, although the naturalist Pennant has been sadly taken to task for having recorded and believed the fact, that one of these beasts had been frightened by the mere unfolding of an umbrella. Whilst a party of ladies and gentlemen were seated under the shade of some trees on the banks of a river in Bengal, they observed a tiger preparing to spring; “one of the ladies, with amazing presence of mind, laid hold of an umbrella, and furlled it full in the animal’s face, which instantly retired, and gave the company an opportunity of removing from so terrible a neighbour.” Such is Pennant’s account, and although rather badly expressed, there can be no just reason for doubting its truthfulness. Confirmatory of this story, we have recently, through the columns of the *Times*, been made acquainted with the circumstance and results of a frightful attack, where a light umbrella proved, for the time at least, a most valuable instrument of defence. An English person, whose letter dates from Penang, February 10, 1859, writes:—“My escape from the tiger was truly miraculous, but that of Padre Cuellon was still more so, as the following details of the attack upon that worthy priest will clearly prove. The padre was on his way to church, and was immersed in the study of his sermon, when a tiger, to his utter surprise, suddenly rushed out of the jungle or tall grass; but as the beast had not measured its distance to a nicety, the padre, walking very quickly, was more frightened than hurt. The tiger, however, brushed so close to him, that his trowsers were torn, the snap of the beast being almost within a hair’s-breadth of his leg. The brute, not contented with a single spring, made another charge upon the poor padre, and as he had nothing wherewith to defend himself but his large paper umbrella, he suddenly opened it out in the animal’s face, which had the effect of cowing it for a time. The tiger, however, evidently gamer or more pertinacious in his attacks than is wont with his tribe, charged the padre at least a dozen times, which occupied nearly twenty minutes. In the meantime the padre gradually edged towards a tree in an open space of ground, and as there was a large white ant’s nest between him and the tiger, round which the latter had to make, this enabled the padre to climb the tree and get out of his way. The tiger, on getting round the nest, was at first puzzled at not seeing his intended victim; but in a few minutes he had his nose to the ground, and so scented the whereabouts of the padre. The tiger quietly sat down under the tree, and gave a wistful look upwards, but it was of no avail. The natives at length hearing the cries of the worthy padre, hastened to the spot, and rendered the assistance required. The tiger fled the instant it heard their shouts. The poor priest burst into tears, and sang the ‘Te Deum,’ in token of gratitude for his

delivery. Padre Cuellon, however, did not rally long; the fright had too serious an effect upon his system, and in about ten days he sank to rise no more.” We might furnish many other proofs of the cowardly conduct of the tiger. Captain Thomas Williamson—no mean authority, and no mere closet naturalist—deliberately gives it as his opinion, that the tiger is more of a coward than any other beast of prey; “its treacherous nature induces it, almost without exception, to conceal itself until its prey may arrive within reach of its spring—be its victim either bulky or diminutive. Size seems to occasion no deviation in the tiger’s system of attack, which is founded on the art of surprising. We find, accordingly, that such as happen to keep the opposite side of a road by which they are somewhat beyond the first spring, often escape injury; the tiger being unwilling to be seen before he is felt. Hence it is rarely that a tiger pursues; but, if the situation permit, his cunning will not fail to effect his purpose; he will steal along the road’s side among the bushes parallel with the traveller’s course, until one of the many chances which present themselves, of finding him within reach, induces to the attack. Often where the country is rather too open to allow his proceeding in this manner, the tiger will take a sweep among underwood or through ravines, in order to meet the traveller again, at a spot whence he may take his spring. Tigers are extremely partial to such sites as command a road, selecting one rather less frequented, in preference to one that is much in use. In the former they are certain of finding as much as will answer their daily wants.” On one occasion, observes the same author, “I was travelling past in my palankeen, through the Ramghur district, which is mountainous and little cultivated, being for the most part in a state of nature and everywhere abounding in jungles, when a *bangy-wollah*, who conveyed two baskets of linen and refreshments, and who preceded the palankeen about an hundred and fifty yards, set down his load and seated himself on the side of the road to rest awhile. About two yards behind him was a small bush, not much larger than a good-sized currant tree, round which a small quantity of jungle grass was growing to the height of about three feet. There was not another twig to be seen for at least half a mile on that side of the road. No sooner had the poor fellow seated himself, than a tiger sprang from behind, or rather from within the bush, and, after giving the fatal blow with his paw, seized the man by the shoulder, and dragged him off with the utmost ease at a round pace, into a thick cover which had as formerly skirted the road, but which had by order of government been cut away to the distance of about a hundred yards, for the safety of travellers.” Some such deceitful plan is, in point of fact, the ordinary method adopted by the tiger for overcoming its prey. The melancholy death of Sir Hector Munro’s son took place in a similar manner. Several writers have recorded the incident, which, according to Mr. Wood, took place under the following circumstances:—“This unfortunate gentleman, accompanied by three of his friends, went on shore, December 22, 1792, on Sawgar Island, to shoot deer. They continued their sport till the afternoon, when they

retired to the edge of a jungle to refresh themselves, where they had not remained long before one of the party, who was leaving the rest to shoot a deer, heard a dreadful roar, and saw a large tiger spring on poor Munro, and rush with him into the jungle with the greatest ease, dragging him through everything that obstructed his course, as if all were made to yield to his amazing strength. All that his companions could do to rescue their friend from this shocking situation, was to fire at the tiger; and it is evident that their shots took effect, since in a few minutes after, Mr. Munro staggered up to them and fell. Every medical assistance that the ship afforded was procured for him immediately, but in vain; he expired in the course of twenty-four hours, in the greatest agonies. His head was torn, his skull fractured, and his neck and shoulders covered with wounds made by the claws of the savage beast. It is worthy of observation, that neither the large fire that was blazing close to them, nor the noise and laughter which, it seems, they were making at the time, could divert this determined animal from his purpose." This, however, is no proof of the tiger's bravery, since it fell upon them unawares, and their noise was that of unsuspecting mirth, and not of the kind to scare away such a cowardly enemy, but rather to attract him. Tiger-hunting in India is considered the noblest and most dangerous of sports; and from the mass of interesting details which have appeared in various works devoted to the subject, it is difficult to decide which are the most meritorious records of the chase. Captain Mundy tells us of a hunting party who sprung a tiger, when the following scene ensued:—This beast "took to the open country, which would have more become a fox than a tiger, who is expected by his pursuers to fight, and not to run; and as he was flushed on the flank of the line, only one bullet was fired at him ere he cleared the thick grass. He was unhurt, and we pursued him at full speed. Twice he threw us out by stopping short in small strips of jungle, and then heading back after we had passed; and he had given us a very fast trot of about two miles, when Colonel Arnold, who led the field, at last reached him by a capital shot, his elephant being in full career. As soon as he felt himself wounded, the tiger crept into a close thicket of trees and bushes, and crouched. The two leading sportsmen overran the spot where he lay, and as I came up I saw him through an aperture rising to attempt a charge. My *mahout* had just before, in the heat of the chase, dropped his ankors, or goad, which I had refused to allow him to recover; and the elephant being notoriously savage, and further irritated by the goading he had undergone, became consequently unmanageable; he appeared to see the tiger as soon as myself, and I had only time to fire one shot, when he suddenly rushed with the greatest fury into the thicket, and falling upon his knees, nailed the tiger with his tusks to the ground. Such was the violence of the shock, that my servant, who sat behind, was thrown out, and one of my guns went overboard. The struggles of my elephant to crush his still resisting foe, who had fixed one paw on his eye, were so energetic, that I was obliged to hold on with all my strength to keep myself

in the houdah. The second barrel, too, of the gun, which I still retained in my hand, went off in the scuffle, the ball passing close to the *mahout's* ear, whose situation, poor fellow, was anything but enviable. As soon as my elephant was prevailed upon to leave the killing part of the business to the sportsmen, they gave the roughly-used tiger the coup-de-grace." Sometimes, when the elephant rushes upon the tiger in the manner just mentioned, it is absolutely impossible for the riders to keep their seats. The author of the "Oriental Field Sports" gives an amusing illustration of an accident of this kind which happened to Captain John Rotton:—"He was one of a very numerous party assembled for the purpose of tiger-hunting, and was mounted on a very fine male elephant, that, far from being timid, was very remarkable for a courage scarcely to be kept within the bounds of prudence. This singularly fine animal having, after much beating a thick grass, hit upon the tiger's situation, uttered his roar of vengeance, which roused the lurking animal, occasioning him to rise so as to be seen distinctly. No sooner did the tiger show himself, than Captain Rotton, with great readiness, bending his body a little to the left, took aim at him as he stood up, crosswise, almost close to the elephant's head. The elephant no sooner espied his enemy, than he knelt down, as is common on such occasions, with the view to strike the tiger through with his tusks. At the same time the tiger, sensible of the device, as suddenly threw himself on his back, thereby evading the intended mischief, and ready to claw the elephant's face with all four feet, which were thus turned upwards. Now, whether Captain Rotton had not been in the habit of joining in such rapid evolutions, or that the elephant forgot to warn him to hold fast, we know not; but, so it happened, that the delicate situation in which he was placed, while taking his aim, added to the quickness of the elephant's change of height forward, combined to project him, without the least obstruction, from his seat, landing him plump on the tiger's belly! This was a species of warfare to which all parties were apparently strangers. The elephant, however fearless in other respects, was remarkably alarmed at the strange round mass—the captain being remarkably fat—which had shot like a sack over his shoulder; while the tiger, judging it to be very ungentlemanly-like usage, lost no time in regaining his legs, trotting off at a round pace, and abandoning the field to the victorious captain!" With regard to other modes of destroying tigers, it may be observed generally that these animals are not very easily secured by traps. According to Williamson, they adopt a very ingenious method in Persia. "This device consists of a large semi-spherical cage, made of strong bamboos or other efficient materials, woven together, but leaving intervals throughout of about three or four inches broad. Under this cover, which is fastened to the ground by means of pickets, in some places where tigers abound, a man, provided with two or three short strong spears, takes post at night. Being accompanied by a dog, which gives the alarm, or by a goat, which by its agitation answers the same purpose, the adventurer wraps himself up in his quilt, and very composedly goes to sleep, in full confidence of his

safety. When a tiger comes, and, perhaps after smelling all around, begins to rear against the cage, the man stabs him with one of the spears through the interstices of the wicker-work, and rarely fails of destroying the tiger, which is ordinarily found dead at no great distance in the morning." Another plan, stated by the same authority to be employed in Oude, is too amusing to pass unnoticed:—"The track of a tiger being ascertained, which, though not invariably the same, may yet be known sufficiently for the purpose, the peasants collect a quantity of the leaves of the praus, which are like those of the sycamore, and are common in most underwoods, as they form the larger portion of most jungles in the north of India. These leaves are smeared with a species of bird-lime, made by bruising the berries of an indigenous tree; they are then strewed with the gluten uppermost, near to that opaque spot to which, it is understood, the tiger usually resorts during the noon-tide heats. If by chance the animal should tread on one of the smeared leaves, his fate may be considered as decided. He commences by shaking his paw, with the view to remove the adhesive incumbrance; but finding no relief from that expedient, he rubs the nuisance against his face with the same intention, by which means his eyes, ears, &c., become agglutinated, and occasion such uneasiness as causes him to roll, perhaps among many more of the smeared leaves, till at length he becomes completely enveloped, and is deprived of sight. In this situation he may be compared to a man who has been tarred and feathered. The anxiety produced by this strange and novel predicament soon discovers itself in dreadful howlings, which serve to call the watchful peasants, who, in this state, find no difficulty in shooting the mottled object of detestation." A more common method of destroying tigers is that of shooting them from a moychaun or platform. This temporary elevation is erected only when a tiger has carried off some animal, and the haunt of his concealment has been duly ascertained by finding the half-mangled carcase. The platform is then rapidly constructed of bamboo or other poles, and raised about twenty feet from the ground. On the tiger's return, the native sheearie, or sportsman, seldom fails to kill or mortally wound the beast, for which, on his return home, he is amply rewarded by money, gifts, and congratulations. In conclusion, we may remark that the tiger is capable of being tamed, but its disposition is irascible and uncertain. The female usually produces from two to four cubs at a birth.

THE PUMA (*Felis concolor*), Cougar, or American lion, as it is erroneously called, is easily recognized by its nearly uniform fawn-coloured fur, which in the young state, however, is faintly marked at the sides with spots of a rather deep tinge of the same hue. The inner sides of the legs, as well as the under parts of the throat and belly, are lighter, inclining to white; but the posterior aspect of the ears, especially at the base, the sides of the muzzle, and the tip of the tail, are black. The body is about four feet six inches, not including the tail, which measures some six and twenty inches. With regard to its habits, early writers have represented the Puma to be an extremely savage species. This is indeed quite true, in so far as it

relates to its depredations among cattle; but it has seldom been known to attack any human being. Mr. Lawson, in his "History of Carolina," states that his prey consists of "swine's flesh, deer, or anything he can take. No creature is so nice and clean as this in his food. When he has got his prey, he fills his belly with the slaughter, and carefully lays up the remainder, covering it very neatly with leaves, which, if anything touches, he never eats any more of it." The Puma is an excellent climber; but, as a rule, it appears to prefer the low, swampy, and more open grounds, where it may commit terrible havoc among herds of cattle pasturing in these situations. It has been known to destroy as many as fifty sheep in a single night. The Puma formerly occupied an extensive geographical range, extending from Canada to Patagonia; but the progress of civilization has made terrible inroads upon its haunts, it being now confined to limited areas chiefly in the prairies of the north and the marshy lowlands of the south. In the Pampas it is hunted and taken with the lasso, while in Canada and the States it falls to the more surely destructive rifle. When taken young the Puma is easily tamed, and in the domesticated state, exhibits all the playfulness of a kitten; while on being caressed it utters the characteristic purring sound. In the British Museum's list of Felidæ it is associated with the leopards.

TRAILL'S PUMA (*Felis unicolor*), or Spotless cat, appears to be quite distinct, being little more than half the size of the true Puma. The body measures thirty-two inches, exclusive of the tail, which would give us another twenty inches. "The general hue of this species is a beautiful glossy reddish-brown. The colour of the whole upper part of the body, including the head and tail, has a considerable resemblance to that of a dark bay horse. The tint becomes gradually paler on the sides and under part of the neck, and passes by imperceptible shades into an ochry brown on the belly. When closely examined, the darker colour of the back is partly owing to an intermixture of blackish-brown hairs with the rest of the fur. The hair over the body is rather short, like that usually seen on a smooth Spanish pointer." Dr. Traill further observes, by way of comparison, that "the head of the Spotless cat is much more pointed, its nose more elevated, and its limbs are much more slender in proportion to its size, than in the puma. The strength of the jaws and size of the teeth are likewise proportionally less. In the puma the backs of the ears are black; in our animal they are of the same colour as the adjacent parts. The tail of the puma is claviform, or appears thickened towards the tip, which is black; but the tail of the Spotless cat is nearly of one thickness throughout, and it wants the conspicuous black tip." All that our authority has recorded of its habits may be summed up in a few words, namely, that it occupies the interior of large forests, preying upon monkeys, quadrupeds, and birds.

THE LION (*Felis Leo*)—Plate 8, fig. 28—occupies a much wider geographical range than the tiger, especially if we regard the Gambian and maneless forms as mere varieties of a single species. The latter kind are found in the Indian territory of Guzerat, and in the adjacent

peninsula of Cutch. In all probability there is but one true species of lion, and this in general is characterized by the possession of a uniformly tawny or yellowish-ruddy fur, the tail presenting a bushy tuft of long black hairs at the tip. The male is also furnished with a large flowing mane, which covers the back part of the head, as well as the entire neck, extending over the shoulders to a greater or less extent. The young are frequently marked with roundish spots and dark stripes along the back. Curiously banded hybrids have also been occasionally produced by associating the lion with the tigress. In our introductory observations on the Carnivora, we have already dwelt on the structure of the skeleton of this most highly developed type of the order, and in our remarks on the Felidæ proper, we have been careful to illustrate the distinguishing characteristics common to the lion and its allies; but there still remains an apparently trifling matter which has given rise to much controversy, and cannot therefore be passed unnoticed. We allude to the occasional presence of a corneous thorn-like prickle developed at the extremity of the lion's tail. For a long period we remained sceptical as to the genuine character of this peculiar dermal process, conceiving it to be a merely accidental thickening or induration of the caudal integument, and serving no particular purpose in the economy of this animal's habits. The question has, however, been fairly set at rest by Messrs. Bennett and Woods; the former gentleman having, at a meeting of the Zoological Society of London in 1832, exhibited one of these claw-like appendages which had been previously removed from the tail of a lion then living in the society's menagerie, Regent' Park. This claw is about the third of an inch long, solid throughout the greater part of its extent, sharp at the apex, and slightly hollowed out at the base. Its function has been supposed to be connected with a lashing of the tail for the purpose of stimulating anger; but in our view it is more probably concerned in the action of scratching out or combing hair where portions of the fur have been accidentally matted together. Be that as it may, its existence is a remarkable fact; and what perhaps is still more strange, is, that its presence has recently received confirmation from a source of authority far more ancient than the oft-quoted statements of Didymus of Alexandria, who flourished forty years prior to the Christian era. The Assyrian sculptures plainly aver that the lion-hunting people of that early period, some seven hundred years before Christ, were well acquainted with this horny development, seeing that their artists have faithfully depicted it on the imperishable monuments of their ancient might! Strange, we repeat, that the elucidation of a long-disputed point in natural history and science, should at length receive assistance and confirmation from the disinterred memorials of a by-past race—of a people who bred and reared lions expressly for the chase and other kinds of sports! "Let the spectator," says M. Bonomi, in his attractive volume entitled, "Nineveh and its Palaces," "now examine these interesting sculptures, and consider for himself the various attitudes of the dead and dying lions, what a familiarity with the result of the various wounds

each separate example displays! How this lioness, wounded in the spinal cord, drags her paralyzed hinder quarters after her! How that lion, wounded in the eye, puts up his paw with agony to the spot! How another, pierced with four arrows, is staggering in the last convulsion! How yet another, wounded in the brain, has fallen over on his back! How this one, wounded in the lungs, stops to pour out the life-stream! And lastly, how certain it is that the king and his court, and the inhabitants of Nineveh in general, must have been familiar with such exhibitions to have required so many cruel details at the hand of the artist!" These and other records also testify that in early times lions were extremely numerous in the eastern parts of Asia; and we also learn from Herodotus that they formerly existed in Europe, the baggage camels of Xerxes' army being, we are told, attacked in their march from Acanthus towards that part of Turkey now called Salonica. But in modern times it is to Africa that the lion-hunter directs his steps. Accordingly we have of late years, especially, received important additions to our knowledge of the instincts and habits of the lion; and it is now pretty well understood that the noble qualities ascribed to this beast by Buffon and his copyists, have existed only in their imaginations, since, on the contrary, it has been continually shown, that the lion, like the tiger, is ever ready to take advantage of a comparatively weak and unguarded prey, and by the execution of a momentary dash, to bring it to the ground. A full-grown lion weighs from thirty-five to nearly forty stone; consequently few animals can resist the fearful crash of such a weight falling upon them unawares. Except when pressed for food, the lion is certainly a rather lazy and indolent beast; but this unwillingness to commit havoc for the mere pleasure of the sport, does not entitle it to receive the character of being brave, noble, or magnanimous—qualities which it assuredly does not possess. If we turn our attention to the testimony of eminent and distinguished travellers, what do we find? Sparrman mentions the case of a farmer, named Jacob Kok, who, "when walking over his lands with his loaded gun, unexpectedly met a lion. Being an excellent shot, he thought himself pretty certain, from the position in which he was, of killing it, and, therefore, fired his piece. Unfortunately he did not recollect that the charge had been in it for some time, and consequently was damp; so that his piece hung fire, and the ball, falling short, entered the ground close to the lion. In consequence of this he was seized with a panic, and took directly to his heels; but, being soon out of breath, and closely pursued by the lion, he jumped on a little heap of stones, and there made a stand, presenting the but-end of his gun to his adversary, fully resolved to defend his life as well as he could to the utmost. This deportment had such an effect on his pursuer, that he also made a stand, and lay down at a distance of a few paces from the heap of stones, seemingly quite unconcerned. Jacob, in the meantime, did not stir from the spot; besides, he had in his flight unfortunately dropped his powder-horn. At length, after waiting a good half hour, the lion rose up, and at first went very slowly, and step by

step only, as if he had a mind to steal off; but as soon as he got to a greater distance, he began to bound away at a great rate." Here, at all events, our lion did not exhibit much courage or bravery; and, as another instance of cowardice on the part of this so-called noble animal, we quote the statements of Captain Harris, who remarks that, early one rainy morning, when he and his companions were peeping out of their canvas-covered waggon, in order to ascertain if there was any prospect of its clearing up, they "perceived three lions squatted within a hundred yards, in the open plain, attentively watching the oxen. Our rifles," he adds, "were hastily seized, but the dampness of the atmosphere prevented their explosion. One after another, too, the Hottentots sprang out of the pack waggon, and snapped their guns at the unwelcome intruders as they trotted sulkily away, and took up their position on a stony eminence at no great distance. Fresh caps and priming were applied, and a broadside was followed by the instantaneous demise of the largest, whose cranium was perforated by two bullets at the same instant. Swinging their tails over their backs, the survivors took warning by the fate of their companion, and dashed into the thicket with a roar. In another half hour the voice of *Leo* was again heard at the foot of the mountains, about a quarter of a mile from the camp; and from the waggon-top we could perceive a savage monster rampant, with his tail hoisted and whirling in a circle, charging furiously along the base of the range, and in desperate wrath making towards John April, who was tending the sheep. Every one instinctively grasped his weapon and rushed to the rescue, calling loudly to warn the expected victim of his danger. Without taking the smallest notice of him, however, the infuriated monster dashed past, roaring and lashing his sides, until concealed in the mist." So much for the lion's courage. Another false appellation by which he is known, is that of the dignified title of "monarch of the forest;" but, as Mr. Burchell remarks, this name is not very applicable, seeing that he is seldom seen except amongst low thickets and brushwood, or in the open plains. Captain Harris, who employs the misnomer without comment, is very careful to tell us, that the fine specimens seen in our menageries are, as it were, "but the shadow of that animal which clears the desert with his rolling eye." No doubt our semi-domesticated examples lose something of that lustre of the eye, and breadth of limb, which characterize the wild and unfettered beast; nevertheless, our conceptions of a lion's strength are perhaps as accurately realized by an examination and dissection of such examples as are brought over, or even bred in this country, as by the description and poetical language above adopted. In the sad story given by Mr. Gordon Cumming, of the seizure and death of a Hottentot named Hendrick, the lion's attack was of the most cowardly character. "It appeared that when the unfortunate Hendrick rose to drive in the ox, the lion had watched him to his fireside; and he had scarcely lain down when the brute sprang upon him and Ruyter (for both lay under one blanket) with his appalling murderous roar, and, roaring as he lay, grappled him with his fearful claws, and kept biting

him on the breast and shoulder, all the while feeling for his neck; having got hold of which, he at once dragged him away backwards round the bush into the dense shade. As the lion lay on the unfortunate man, he faintly cried—'Help me, help me, O God! men, help me!' after which the fearful beast got hold of his neck, and then all was still, except that his comrades heard the bones of his neck cracking between the teeth of the lion." With regard to the death-dealing strength of the lion's paw, Mr. Burchell relates the following incident:—While he and his friends were out hunting, they sprung a lion and lioness. The latter soon disappeared, but the former made a slight advance, as if to show fight. "At this instant the dogs boldly flew in between us and the lion, and, surrounding him, kept him at bay by their violent and resolute barking. The courage of those faithful animals was most admirable. They advanced up to the side of the huge beast, and stood making the greatest clamour in his face, without the least appearance of fear. The lion, conscious of his strength, remained unmoved at their noisy attempts, and kept his head turned towards us. At one moment the dogs, perceiving his eye thus engaged, had advanced close to his feet, and seemed as if they would actually seize hold of him; but they paid dearly for their imprudence: for, without discomposing the majestic and steady attitude in which he stood fixed, he merely moved his paw, and at the next instant I beheld two lying dead. In doing this he made so little exertion, that it was scarcely perceptible by what means they had been killed. Of the time which we gained by the interference of the dogs, not a moment was lost. We fired upon him; one of the balls went through his side, just between the short ribs, and the blood began to flow; but the animal still remained standing in the same position. We had now no doubt that he would spring upon us. Every gun was instantly reloaded; but happily we were mistaken, and were not sorry to see him move quietly away, though I had hoped in a few minutes to have been enabled to take hold of his paw without danger."

As to the destructive habits of the lion, Mr. Andersson tells us of one powerful beast slain by Messrs. Galton and Bam, which only a short time previous had killed upwards of fifty oxen, cows, and horses! In its stomach, when shot, was a small dog bitten into five pieces, the little animal having incautiously approached the lion during the hunt. Many other interesting details regarding the habits of the lion are given by this most successful hunter. On one occasion Mr. Andersson had a marvellously lucky escape. When eating his dinner, a number of native damaras and mamaques came to tell him that an *ongema*, as they call it, had destroyed one of their goats, and that they hoped he would help them to kill it. He consented. The lion had taken refuge in a dense tamarisk brake, and Mr. Andersson says:—"I had proceeded for some time, when suddenly, and within a few paces of where I stood, I heard a low, angry growl, which caused the dogs, with hair erect in the manner of hogs' bristle, and with their tails between their legs, to slink behind my heels. Immediately afterwards a tremendous shout of "*ongema! ongemea!*" was raised by the natives

on the bank above, followed by a discharge of fire-arms. Presently, however, all was still again; for the lion, as I subsequently learnt, after showing himself on the outskirts of the brake, had retreated into it. Once more I attempted to dislodge the beast; but finding the enemy awaiting him in the more open country, he was very loath to leave his stronghold. Again, however, I succeeded in driving him to the edge of the brake, where, as in the first instance, he was received with a volley; but a broomstick would have been equally efficacious as a gun in the hands of these people, for out of a great number of shots that were fired, not one seemed to have taken effect. Worn out at length with my exertions, and disgusted beyond measure at the way in which the natives bungled the affair, I left the tamarisk brake, and, rejoining them on the bank above, offered to change place with them; but my proposal, as I expected, was forthwith declined. As the day, however, was now fast drawing to a close, I determined to make one other effort to destroy the lion, and, should that prove unsuccessful, to give up the chase. Accordingly, accompanied by a single native, I again entered the brake in question, which I examined for some time without seeing anything; but on arriving at that part of the cover we had first searched, and when in a spot comparatively free from bushes, up suddenly sprung the beast within a few paces of me. It was a black-maned lion, and one of the largest I ever remember to have encountered in Africa. But his movements were so rapid, so silent and smooth withal, that it was not until he had partially entered the thick cover—at which time he might have been about thirty paces distant—that I could fire. On receiving the ball he wheeled short about, and, with a terrific roar, bounded towards me. When within a few paces, he couched as if about to spring, having his head imbedded, so to say, between his fore-paws. Drawing a large hunting-knife and slipping it over the wrist of my right hand, I dropped on one knee, and, thus prepared, awaited his onset. It was an awful moment of suspense, and my situation was critical in the extreme. Still my presence of mind never for a moment forsook me—indeed, I felt that nothing but the most perfect coolness and absolute self-command would be of any avail. I would now have become the assailant; but as—owing to the intervening bushes, and clouds of dust raised by the lion's lashing his tail against the ground—I was unable to see his head, while to aim at any other part would have been madness, I refrained from firing. Whilst intently watching his every motion, he suddenly bounded towards me; but—whether it was owing to his not perceiving me, partially concealed as I was in the long grass, or to my instinctively throwing my body on one side, or to his miscalculating the distance—in making his last spring, he went clear over me, and alighted on the ground three or four paces beyond. Instantly, and without rising, I wheeled round on my knee, and discharged my second barrel, and, as his broadside was then towards me, lodged a ball in his shoulder, which it completely smashed. On receiving my second fire, he made another and more determined rush at me; but, owing to his disabled state, I happily avoided him. It

was, however, only by a hair's breadth, for he passed me within arm's length. He afterwards scrambled into the thick cover, beyond where, as night was then approaching, I did not deem it prudent to pursue him." Next morning they found the spot where the poor brute had passed the night in sleepless agony; but it was not until the expiration of several days that his carcase was found, then in a state of decomposition; and thus ends the story. Many other narrow escapes are recorded by Mr. Andersson, some of which are even more astonishing. In most instances it would appear that these escapes depend upon the cowardice of the lion, which also does not seem to be able to recognize the proper moment when an intended victim is entirely within its power. Thus, for example, what can be more extraordinary than the following incident, given by the same gentleman?—An old waggon-driver, Piet by name, "riding along one morning in a very weak state, having just recovered from a severe fever, a lion suddenly rushed on him. The ox became frightened, and threw the old man. One of his feet was caught in the stirrup; but, fortunately, the 'weld' shoe slipped off. 'I know,' said the old veteran hunter, 'I was thrown, and that I got on my legs again, but in what manner is quite a mystery to me to this day. I called, as loud as my feeble voice permitted, to my people to bring a gun, the lion always getting nearer and nearer, until he stood within arm's length. I once or twice tried to pull out my pistol or my sword-knife, which, as you know, I usually carry about with me, but in my anxiety I missed them. My jacket was lying just in front of me on the ground, but the brute had one of his paws on it. I felt desperate, however, and, pulling it forcibly away, struck the lion on the head, when he grinned and growled terribly, and I expected every moment he would tear me to pieces. At this juncture my damara, who fortunately had heard my cries of distress, came running up with my gun. Taking the piece from the man, I fired at the lion, who had retreated a few paces, where he sat quietly looking at me. I don't know whether I hit him, for what with the sudden fright and my weak constitution, I felt very unsteady. Be that as it may, it had at all events the effect of searing him away, for at the report of the gun he instantly betook himself to cover.'" In such cases as the above, one cannot but recognize a providentially-implanted fearfulness in the lion, which frequently gives to the human victim an opportunity of escape; and perhaps, therefore, those instances of deliverance, where the animal has already partially succeeded in overcoming his intended prey, ought to be considered the more remarkable—such, for example, as that of the escape of Dr. Livingstone, which is described by the distinguished missionary himself as follows:—"Being about thirty yards off, I took a good aim at his body through the bush, and fired both barrels into it. The men then called out, 'He is shot, he is shot!' Others cried, 'He has been shot by another man too; let us go to him!' I did not see any one else shoot at him, but I saw the lion's tail erected in anger behind the bush, and, turning to the people, said, 'Stop a little till I load again.' When in the act of ramming down the bullets I heard a shout.

Starting, and looking half round, I saw the lion just in the act of springing upon me. I was upon a little height; he caught my shoulder as he sprang, and we both came to the ground below together. Growling horribly close to my ear, he shook me as a terrier dog does a rat. The shock produced a stupor similar to that which seems to be felt by a mouse after the first shake of the cat. It caused a sort of dreaminess, in which there was no sense of pain nor feeling of terror, though quite conscious of all that was happening. It was like what patients partially under the influence of chloroform describe, who see all the operation, but feel not the knife. This singular condition was not the result of any mental process. The shake annihilated fear, and allowed no sense of horror in looking round at the beast. This peculiar state is probably produced in all animals killed by the Carnivora; and if so, is a merciful provision by our benevolent Creator for lessening the pain of death. Turning round to relieve myself of the weight, as he had one paw on the back of my head, I saw his eyes directed to Mebalwe, who was trying to shoot him at a distance of ten or fifteen yards. His gun, a flint one, missed fire in both barrels; the lion immediately left me, and, attacking Mebalwe, bit his thigh. Another man, whose life I had saved before, after he had been tossed by a buffalo, attempted to spear the lion while he was biting Mebalwe. He left Mebalwe and caught this man by the shoulder; but at that moment the bullets he had received took effect, and he fell down dead. The whole was the work of a few moments, and must have been his paroxysm of dying rage. In order to take out the charm from him, the Bakatla on the following day made a huge bonfire over the carcase, which was declared to be that of the largest lion they had ever seen. Besides crunching the bone into splinters, he left eleven teeth wounds in the upper part of my arm."

In attacks on the more powerful quadrupeds, the lion seldom approaches them singly. Thus, Messrs. Oswell and Vardon witnessed three male lions pulling down a buffalo, and they were enabled to shoot two of the plunderers on the spot. Again, Mr. Andersson saw no less than five lions, two of which were in the act of similarly destroying "a splendid giraffe, the other three watching close at hand," ready to take part in the deadly strife. The last-named sportsman also mentions two instances where the lion had been guilty of cannibalism. In one case a male had devoured a lioness, having apparently quarrelled over an insufficient meal, consisting of a spring-bok, on which they had evidently been feasting together! In the other case, after Mr. Andersson and his friends had severely wounded a male, a whole troop of lions immediately rushed upon their disabled brother and tore him to pieces. In all these incidents the true cowardly character of the species

is very conspicuous, and it cannot therefore be affirmed, we repeat, that the lion is either brave or magnanimous. In regard to the power of the lion's roar, Dr. Livingstone's observations are too important to pass unnoticed—"The same feeling," says this eminent traveller, "which has induced the modern painter to caricature the lion, has led the sentimentalist to consider the lion's roar the most terrific of all earthly sounds. We hear of the 'majestic roar of the king of beasts.' It is indeed well calculated to inspire fear if you hear it in combination with the tremendously loud thunder of that country, on a night so pitchy dark that every flash of the intensely vivid lightning leaves you with the impression of stone-blindness, while the rain pours down so fast that your fire goes out, leaving you without the protection of even a tree, or the chance of your gun going off. But when you are in a comfortable house or waggon the case is very different, and you hear the roar of the lion without any awe or alarm. The silly ostrich makes a noise as loud, yet he never was feared by man. To talk of the majestic roar of the lion is mere majestic twaddle. On my mentioning this fact some years ago, the assertion was doubted, so I have been careful ever since to inquire the opinions of Europeans, who have heard both, if they could detect any difference between the roar of a lion and that of an ostrich; the invariable answer was, that they could not when the animal was at any distance. The natives assert that they can detect a variation between the commencement of the noise of each. There is, it must be admitted, a considerable difference between the singing noise of a lion when full, and his deep, gruff voice when hungry. In general the lion's voice seems to come deeper from the chest than that of the ostrich; but to this day I can distinguish between them with certainty only by knowing that the ostrich roars by day and the lion by night." The lion, as we have seen, is rather timid than courageous; the testimony of Burchell, Harris, Cumming, Andersson, Livingstone, and many others, clearly showing that it entertains great fear of man. Whilst this mighty beast is actually enjoying a hearty meal, by merely walking up, Captain Harris causes it to march off forthwith. Many similar incidents are also recorded by these distinguished travellers; Dr. Livingstone going so far as to assure us, that there is "more danger of being run over when walking in the streets of London than of being devoured by lions in Africa, unless engaged in hunting the animal." Lions are still very abundant in the interior of that country, but, with an extending civilization, and a more constant supply of fire-arms to the natives, it may be fairly predicted that the regions of the south will ere long become as completely emptied of this huge beast of prey, as have been the once infested districts of Greece and Asia Minor.

ORDER VI.—PINNIPEDIA.

THIS order of amphibious mammals, though, for convenience, here treated as a distinct group, cannot be regarded as zoologically equivalent to any of the foregoing ordinal divisions, inasmuch as it only represents a peculiar section of the Carnivora, properly so called. In accordance, therefore, with the system indicated at the commencement of this work, the Pinnipeds or Seals are here considered separately. The most marked and obvious peculiarity in their organization, consists in the conversion of the limbs into paddles or swimming feet—the modifications of structure by which this change is brought about being best understood by an examination of the skeleton (Plate 34, fig. 114). Bearing in mind what we have already pointed out respecting the osteology of the typical carnivor, it will be noticed that the several skeletal elements of the seal are more or less attenuated, compressed, and shortened, according to circumstances. Thus, instead of the broad massive skull, we have a rather elongated cranium, associated with a movable spine, which is even more flexible than that of ordinary cats. The bones of the pelvis are particularly slender, and but feebly developed, while the shoulder-blades are, on the other hand, remarkably broad. There are no clavicles. The homologous arm and thigh bones, that is, the humeri and femora, are much shortened. The bones of the fore-arm are considerably flattened; and, in the conformation of the hand, the adaptation of the limb for natatory purposes is eminently significant. It will be observed that the phalanges are drawn out, as it were; and, diverging from one another, like the spokes of a wheel, they form mutually-resisting supports for the interdigital webs. The hind paddles, with their membranous expansions, are similarly constructed, stretching out posteriorly in a horizontal direction. All the feet are pentadactylous, the toes of the anterior extremity becoming, one after another, shorter from the thumb outwards. The outer and innermost toes of the hind feet are the most extensively developed. The forward movements of the body upon land are produced by a rapid succession of short shuffling or wriggling leaps, entirely due to the contraction of the muscles of the trunk, and altogether independent of the limbs, the latter only being employed in clambering up the sides of projecting rocks. Generally speaking, the bones are light and spongy in texture; and this circumstance—when taken in connection with the boat-like form of the body, which terminates posteriorly in a short and conical tail, the oar-like limbs, the smooth adpressed fur, together with the flexible spine and powerful muscles—satisfactorily demonstrates how much care has been taken to render these creatures swift, easy, and vigorous swimmers.

FAMILY I.—PHOCIDÆ.

The true Seals have been divided into four sub-families or minor groups, but their differentiating characters are scarcely sufficient to warrant such an

arrangement. The teeth are usually thirty-four in number, of which there may be reckoned six or only four incisors above, and four or two below, together with four canines, and twenty or twenty-two molars; all having the crowns armed with trenchant conical points. The tongue is smooth and bifid at the tip; the stomach is simple, the intestinal canal being comparatively long. In connection with the liver, the posterior vena cava has a sacculated expansion, the use of which is to prevent the necessity of rapid respiration, thereby prolonging the animal's power of remaining under water. The venous blood is thus retarded in its course back to the lungs, until the animal rises for a fresh supply of air. During the action of diving, the nostrils are closed by a muscular sphincter. Under ordinary circumstances seals can remain submerged from fifteen to twenty minutes; and it is stated that, during sleep, they will remain in this condition for as much as an hour, without coming to the surface to breathe. The shining, glossy, adpressed hairs are protected from an injurious action of the water, by an oily secretion which exudes from the skin. Their margins are sinuous, but the long, stout, horny whiskers are uniformly smooth. Seals are for the most part marine, but a few of them pass up the mouths of rivers to fresh-water streams, and even lakes. While at rest, they are usually seen reposing on the ledges of rocks, and basking in the sun; and on being alarmed, they suddenly plunge into the water for security. These animals, as is well known, subsist principally on various kinds of fish; but they will also devour crabs, molluscs, and other oceanic products. Fossil remains of seals occur in the miocene and pliocene deposits.

THE COMMON SEAL (*Phoca vitulina*)—Plate 12, fig. 40—is an inhabitant of the northern seas generally, and was formerly very abundant all along the western coasts of the British islands, as well as those of France; now, however, it is comparatively scarce, except on the shores of Scotland, and its adjacent northern and western isles. The body of the seal is between four and five feet long, having an ashy or yellowish-grey ground colour, which is indistinctly spotted with light brownish-black patches; it exhibits a cylindro-conical form, gradually diminishing in bulk from the region of the chest towards the short broad muzzle in front, and towards the rudimentary tail behind. The eyes are rather large, and protected by a few stiff hairs, forming small eyebrows; the ears being fully-developed, and scarcely visible. One of the most interesting peculiarities by which this species is distinguished, consists in the oblique disposition of the molar teeth, producing a slight overlapping of the ends; this remarkable character having been first pointed out by Professor Nilsson. The brain is largely developed—a fact which in some measure explains that high degree of intellectual manifestation, which the seal is capable of displaying. Though very timid in the wild state, and very difficult to approach with a gun, it is, nevertheless, extremely docile in a semi-domesticated condition. From the

earliest times it has been tamed and taught to perform a number of tricks, and to utter certain responsive sounds, when spoken to by its master. A seal thus instructed has been exhibiting in London, under the title of the "talking and performing fish;" its so-called wonderful performances, however, as might be expected, do not equal the absurdities of a puffing and exaggerating advertisement. Mr. Low, in his "*Fauna Orcadensis*," observes, that in the wild state, "seals seem to have a great deal of curiosity; if people are passing in boats, they often come quite close up to the boat, and stare at them, following for a long time together; if people are speaking loud, they seem to wonder what may be the matter. The church of Hoy, in Orkney, is situated in a small sandy bay, much frequented by these creatures; and I observed, when the bell rang for divine service, all the seals within hearing swam directly to the shore, and kept looking about them, as if surprised rather than frightened, and in this manner continued to wonder as long as the bell rung." Their powers of hearing are remarkably acute, as we have recently verified by speaking softly to the active little seal at present living in the Zoological Society's Gardens, Regent's Park; even while the animal is under water, the very faintest whisper of its name—"Jenny"—does not fail to elicit immediate attention and expectancy. In high northern latitudes the seal is of the greatest economic value. To the Greenlanders it affords an almost exclusive means of subsistence—supplying, as it does, food for the inner man, clothing for the outer man, and light for their ill-furnished dwellings. The seal is also an important article of commerce. A full-grown specimen of this species, if taken in spring, will yield from four to five gallons of oil, while some of the larger kinds will supply considerably more than double that quantity. If extracted while fresh, the oil is beautifully clear and transparent, inodorous, and of a rather pleasant taste. The skin is either prepared with the fur, or tanned to make leather; in either case it is in great demand for making shoes, caps, and other articles of clothing.

THE HARP SEAL (*Phoca Grælandica*) is, as its specific name implies, found very abundant on the ice-bound shores of Greenland, being also an inhabitant of Iceland, and the northern coasts generally, from Newfoundland along the borders of the Frozen Ocean, as far as the sea of Kamtschatka. It is also occasionally transported southward to the western shores of our own sea-girt islands. The fur presents a greyish-white colour, the back being marked by a blackish horseshoe-shaped band, arching backwards from the region of the shoulder to within a few inches of the root of its stumpy tail. This band is broad at the sides, while its outline is very irregular; the anterior half of the head exhibits the same deep brownish-black colour, imparting to the physiognomy a very peculiar look. The molar teeth do not overlap each other, but they leave slight interspaces between their several ends. In regard to the habits of this species, Fabricius states that they leave the coasts of Greenland twice a-year, namely, in March and July, revisiting their haunts in May and September. Their food consists of molluscs and fish, especially salmon. Being stupid and incautious, they fall an easy

prey to the seal-hunters; their fur is much valued, and is less woolly than that of the common species. The female produces one, or rarely two, cubs at a birth; the skins being either white or cream-coloured. These seals have a tendency to congregate and herd together on floating masses of ice at a considerable distance from the shore, under the leadership of one of their number.

THE MARBLED SEAL (*Phoca annulata*) inhabits the coasts of France, and was supposed by Frederick Cuvier to be only a variety of the common species. Professor Nilsson of Copenhagen, however, has determined otherwise. At one time it was believed that this species had been taken on our own coasts, but the impression appears to have been erroneous; it is certainly not improbable that it should find its way thus far northward. The body is about as large as that of *Phoca vitulina*, but it is at once distinguished from it, by the peculiar marbled colour of the fur. A very lively specimen of the Marbled seal, formerly kept in the Jardin des Plantes, afforded the Parisian and other visitors much amusement. Two little dogs were housed with it, and the trio lived on excellent terms; the seal allowing them to take fish out of its mouth while eating, and submitting to many other indignities.

THE GREAT SEAL (*Phoca barbata*) is occasionally found on the northern shores of Scotland; and, according to Mr. Selby, it is an inhabitant of the Farn and Staple islands, off the coast of Northumberland. The body of a full-grown species measures as much as ten, twelve, or even fourteen feet in length, and weighs upwards of forty-five stone. The head is comparatively long, and much arched in front; the eyes are large, the auditory opening being also capacious. The fore-feet have the central toe longest, the outermost on either side being comparatively short. In the adult animal the fur presents a deep brownish-black colour, but in the young state it is of light-greenish hue. The female is provided with four teats, and Mr. Selby states that it "calves in the month of November upon several of the outer rocks, where the young are suckled every tide for the space of fourteen or fifteen days, when the long woolly fur which at first clothed them is cast, and a new covering of close short hair supersedes it; they are then conducted by the dam to the water, from whence they only emerge at intervals."

THE GREY SEAL (*Halichærus gryphus*) is also an inhabitant of the British coasts, being especially abundant on the Irish shores. Professor Nilsson—an excellent authority—states that those living in the Baltic have solitary habits; but, in the neighbourhood of Cork and Waterford, Dr. Ball found them gregarious in small numbers. The Grey seal is also a native of the northern coasts of Europe, and is called the *Utselur* by the Icelanders. Zoologically speaking, it is a species of very great interest, because its structural characters, in some particulars at least, approach very closely those of the walrus; Dr. Gray, indeed, considers it entitled to be regarded as a member of the family which that peculiar form represents. Be that as it may, the canines are present in the lower jaw, while those of the upper are not prolonged into tusks—features which sufficiently distinguish the Phocidæ

from the Tricheidæ. According to Reinhardt, the upper jaw is frequently furnished with a sixth molar on either side, which would make the total number of grinders to be twenty-two. The superior series are simple, displaying only a single pointed crown, but those of the lower jaw are slightly tuberculated. The head is remarkably flat, terminating anteriorly in a broad, truncate muzzle. One of the most striking peculiarities of this species—and one in which it very closely resembles the walrus—consists in the disproportionate size of the brain, as compared with that of the common seal; while the bones of the face are, on the other hand, more cogently developed. The late Dr. Ball of Dublin, in a communication to Professor Bell—after alluding to the fruitless attempts made by his father to rear and tame specimens—has very forcibly remarked that this seal “appears scarcely susceptible of domestication, and the development of the skull seems to indicate as much; for the size of the brain of a specimen nearly eight feet long, did not exceed that of one of *Phoca variegata* (i.e., *P. vitulina*), of less than four feet.”

THE SEA-LEOPARD (*Leptonyx Weddellii*).—M. Frederiek Cuvier formerly associated the various

species of *Leptonyx*, under the generic title of *Stenorhynchus*. They are characterized by the possession of twenty-two teeth, of which eight are incisors, besides the usual number of canines, and twenty molars—each of the latter being provided with three sharp, conical, prong-like tubercles. All of these are slightly compressed, and point more or less upwards and backwards; the central cusp being the longest, and separated from the lateral pair by a deep notch on either side. The hindmost molars are furnished with double fangs. The skull is narrow, elongated, and rather depressed at the centre of the vertex. The claws of the feet are comparatively small, especially those of the hind pair. This species inhabits the shores of the southern hemisphere.

THE CRESTED SEAL (*Stenmatopus cristatus*), or Hoodcap, differs from the ordinary seals, inasmuch as it possesses a remarkable organ, situated at the anterior part of the head. This structure consists of a membranous and muscular pouch, which is divided internally into two compartments by the prolongation of the cartilaginous septum of the nose (fig. 37). By closing its nostrils, the animal has the power of inflating this sac, which then stretches back over the cranium, and

Fig. 37.



The Crested Seal (*Stenmatopus cristatus*).

in the distended condition rises six or seven inches above the vertex. The molar teeth are irregularly tuberculated. The Hoodcap lives chiefly on large floating fields of ice off the coasts of Greenland and the north-eastern shores of America, being seldom seen on land, except in the months of April, May, and June. It is a large species, measuring seven or eight feet in length; and great numbers are annually destroyed by the seal-hunters.

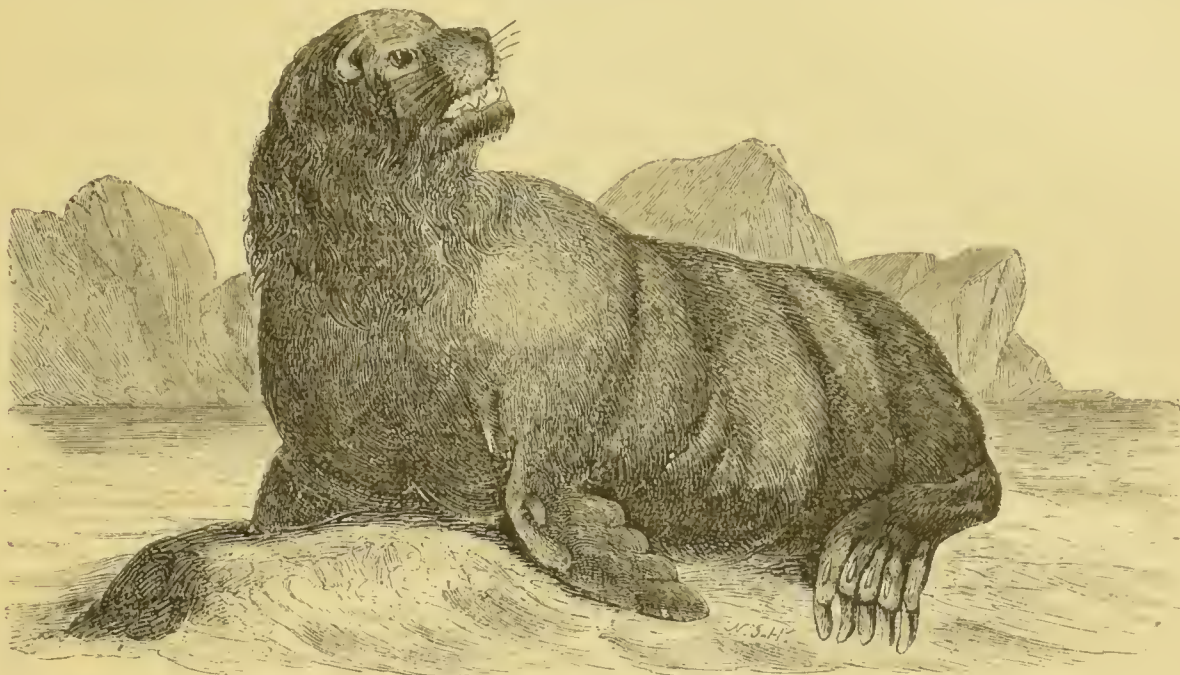
THE SEA-BEAR (*Arctoccephalus ursinus*)—Plate 13, fig. 41—is a native of the north-western shores of America, as well as the coasts of Kamtschatka and the Kurile islands. It is a large, bulky species, upwards of seven feet long. The fur is thick, of a woolly texture, of a greyish-brown tint in the adult, but quite

black in the young animal. The ears are comparatively well-developed, being an inch and a half in length, and clothed with hair. There are ten incisor teeth, six above and four below, the four central ones of the upper series having flat and transversely-grooved crowns; the molars are twenty-two in number. The first toe of the fore-foot is the longest, the remainder gradually shortening in succession, outwards. The interdigital membranes of the hind feet are prolonged considerably beyond the toes in the form of bands. The Sea-bears are polygamous in their habits, a single male jealously guarding upwards of fifty or sixty females. The males are very fierce, as are also the dams when their young are hunted; if wounded, they utter a loud whining cry. The fur is highly valued.

THE SEA-LION (*Otaria jubata*).—Much discrepancy of opinion has all along existed in regard to the distinctions of these aberrant forms of seals, and even now much confusion remains respecting them. Several

species have been included under the above title by different voyagers. The true Sea-lion is a huge animal, the males measuring from ten to fifteen feet in length (fig. 38). The fur has a yellowish-brown colour, the

Fig. 38.

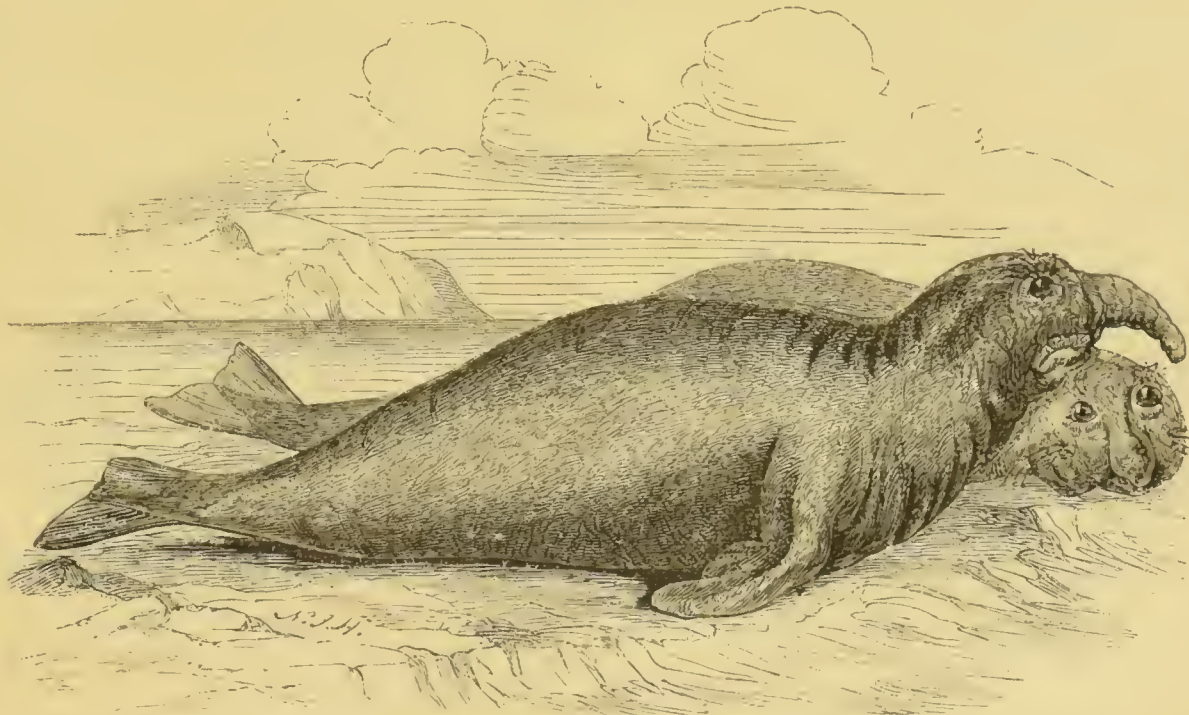
The Sea-Lion (*Otaria jubata*).

neck of the male being provided with a well-developed mane. The ears are only half an inch in length, or rather more, the muzzle being armed with numerous stout long whiskers. This species is also polygamous, a single male tending from twenty to thirty females. They are very fierce and powerful animals, waging destructive wars upon the sea-bears. The Sea-lion is

principally found off the coasts of Terra-del-Fuego and the Falkland Islands.

THE SEA-ELEPHANT (*Morunga proboscidea*) is a gigantic and extraordinary-looking animal. In Professor Nilsson's arrangement it is described as a species of *Cystophora*, a genus which is equivalent to the *Macrorhinus* of F. Cuvier. The title here employed

Fig. 39.

The Sea-Elephant (*Morunga proboscidea*).

is that given in the list of Phocidæ contained in the British Museum. The body of an adult Sea-elephant attains the enormous length of four-and-twenty feet, some specimens, it is said, considerably exceeding this measurement; the young at the time of birth being

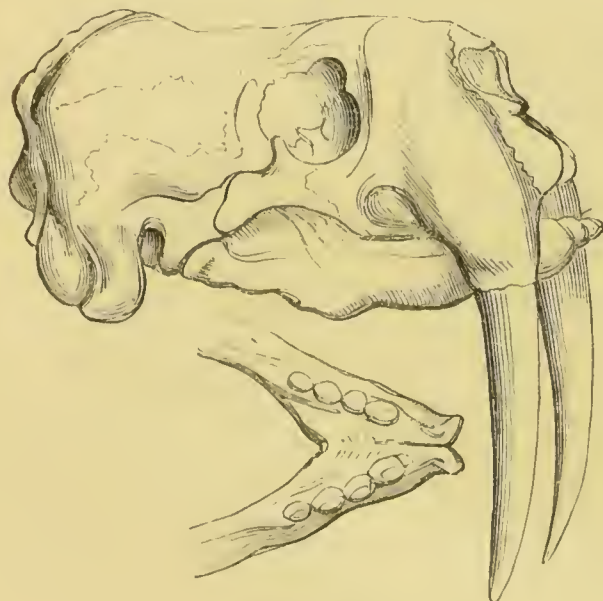
about the size of a full-grown *Phoca vitulina*! The most singular feature in this species, however, consists in the presence of a strongly-developed proboscideiform muzzle in the male, capable of being extended to a distance of twelve inches beyond the mouth, and conse-

quently imparting a very peculiar, if not hideous aspect (fig. 39). In the female there is no trace of this singular apparatus. The canine teeth are large, thick, rather sharply pointed, and curved upwards; the molars being furnished with simple, conical, and irregularly constricted conical crowns. The Elephant-seal enjoys a wide geographical distribution in the southern hemisphere, being found on the coasts of Australia, Kergueland's Land, the Falklands, and other islands both of the South Pacific and Atlantic oceans. It is greatly valued on account of the large quantity of oil which it yields; and, although powerful, it is a comparatively harmless animal, and easily destroyed. Its skin is very thick, and, from its durability when prepared, is much employed in making carriage harness. The habits of the Sea-elephant are somewhat peculiar, inasmuch as it frequents the mouths of rivers, resorting betimes to fresh-water swamps and inland lakes. The male is said to utter when attacked a strange, hoarse, gurgling, wild sound; the voice of the female having some resemblance to the bellowing of an ox. A sailor once lost his life from the violence of an enraged female, in whose presence he had the cruel folly to skin her young one. The dam generally produces two cubs at a birth, the growth of which is so astonishingly rapid, that in eight days they have doubled their natal dimensions. The period of gestation is believed to be between nine and ten months.

FAMILY II.—TRICHECIDÆ.

Externally, the members of this family, as originally established, have a general resemblance to the ordinary seals; but in the form and arrangement of the teeth there are differences of the most marked kind. The cranium is also very unlike that of the typical Phocidæ;

Fig. 40.



Skull and section of the lower jaw of the Walrus.

but in certain of the aberrant genera, this variation is less conspicuous. We have shown this to be the case, especially, in the genus *Halichærus*, which is even associated with the present family in the systematic classification of Dr. J. E. Gray. On carefully examin-

ing the skull of a walrus (fig. 40), the first thing that strikes one is the massive character of all the bones, more particularly those of the anterior part of the face. All the facial modifications here witnessed have reference to the enormously developed tusks; and, consequently, it is in the superior maxillary bone that the more striking morphological changes have taken place. The extension upwards and downwards, as well as the great breadth of this osseous mass, has become necessary, in order to insure the reception and fixation of the base of this rootless and huge canine tooth—the socket, of course, being extremely capacious. This curious osteological change of form has also had the effect of producing an unusually broad muzzle, tilting up, as it were, the aperture of the nostrils. Scarcely less remarkable is the correlative effect produced by these huge canines on the shape of the lower jaw; but here, instead of increasing the width, we find the anterior part of the bone much narrowed and compressed, so as to pass securely forward, between and beyond the not very widely separated tusks—an arrangement which has likewise involved corresponding peculiarities in the dental formula of the adult animal. According to the investigations of Macgillivray, Rapp, Wiegman, and others, there are either ten or twelve incisors, four canines, and eighteen or twenty molars in the young animal; out of these, two grinders, the lower pair of canines, and all the incisors are deciduous, their sockets at length becoming entirely obliterated. We have thus left behind in the full-grown animal only sixteen permanent molars, besides the two tusks developed from the upper jaw; the former are depressed, obliquely truncated, and flat on the crowns; while the tusks, which are directed downwards with a slight curving inwards, measure from fifteen to twenty or twenty-five inches in length, weighing between eight and ten pounds each; they are also proportionately thick. The cranial cavity is small when compared with that of the typical Phocidæ.

THE WALRUS (*Trichechus Rosmarus*), or MORSE—Plate 13, fig. 42—is the only representative of the present family, if we are content to adhere to the arrangement above given. It is a large, bulky animal, the body usually measuring from ten to fifteen feet in length, and, in the case of the males, as much sometimes as twenty feet. The fur is of a deep brownish-black colour, becoming lighter as age advances. The head is comparatively small, terminating anteriorly in an abrupt snout, which is tumid at the sides and clothed with long and very stout whiskers. The lips are particularly thick, while the nostrils are rounded and placed high up on the summit of the muzzle. The auditory apertures are placed well back, but there is no trace of an external auricle; the eyes are comparatively small. The limbs are short, terminating in broad pentadactylous paddles or flippers, having strong interdigital webs. Sir Everard Home's notion that they possessed the power of producing a vacuum to aid the action of climbing, is entirely erroneous. The Walrus is an inhabitant of the shores of the Arctic ocean, being especially abundant on the coasts of Spitzbergen, Nova Zembla, and Behring's Straits. These animals congregate together in herds, varying in

number from fifty to one hundred or more; nevertheless their habits are strictly monogamous. Before going to sleep on the floating ice-fields they take the precaution of appointing sentinels, who, when any danger threatens, forthwith rouse the entire troop, by uttering loud bellowing cries, and instantly all are seen tumbling over into the sea, where they are tolerably secure. If any are wounded the remainder display much sympathy, the mothers defending and carrying off their young with the greatest ardour. On several occasions they have been known to attack a boat's crew, as happened, for example, to two officers who went walrus-hunting by themselves, near Waggat's Straits, in the year 1773. They had succeeded in wounding a solitary one, which immediately dived under water, and after a short time returned with several others, attacked the officers, wrested from them an oar, and very nearly succeeded in capsizing the boat; fortunately another boat came to their assistance, and the infuriated animals were driven off. At

all times the capture of the Walrus is attended with considerable difficulty, for, although not naturally a shy animal, it has learned to dread its human adversary, and therefore takes to the water on the slightest alarm; moreover, the skin is sufficiently hard to resist the harpoon, unless it has been driven home with great force. The tusks are much prized; their ivory being, bulk for bulk, far more valuable than that of the elephant; the texture of the dentine is denser, and the colour of a purer white. The Walrus is omnivorous, and in its stomach there have been found remains of young seals, fish, shrimps, and other crustacea; also various kinds of molluscs and sea-weeds, especially of the common kind—*Fucus digitatus*.

Those who desire further information respecting the habits and mode of capturing the Walrus, we beg especially to refer to the thirteenth and thirtieth chapters of the first volume of Dr. Kane's "Arctic Explorations," where they will find most interesting details, for which we have here no space.

ORDER VII.—RODENTIA.

THE Rodents constitute a well-defined natural group, comprehending a great multitude of comparatively small species, all of which are characterized by the possession of peculiar incisor teeth. These organs are usually four in number, two occupying the upper, and two the lower jaw; they are also placed prominently forward below the muzzle, and are separated from the molar teeth by a considerable interspace (fig. 41). Their office is essentially that of gnawing; hence the Rodents are sometimes called gnawers, or *rongeurs* by the French. The form of each incisor tooth resembles a chisel, the anterior and superior edge being remarkably sharp and trenchant; the tooth is likewise so constructed that its tissue, and therefore function also, is in no way damaged by continuous use; on the contrary, every time it is put in action, the weapon chisels down the hard substances required for food or other purposes, while, at the same time, it sharpens

Fig. 41.



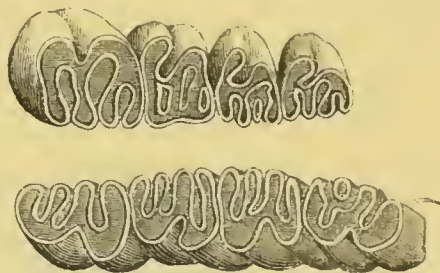
Skull of the Rabbit.

itself, and is thus always fit for use. This interesting result depends, for its integrity, on the following structural arrangement: The anterior and convex surface of the organ is coated with a thin layer of hard enamel, the central mass consisting of the somewhat less dense, but still tolerably strong ivory; and from this disposition of the two structures, it will readily be perceived that, during attrition, the ivory must wear away more

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quickly than the enamel, which is consequently left standing prominently forward in the form of a chisel-like process. The molar teeth are few in number,

Fig. 42.



Molar Teeth of the Beaver.

seldom exceeding four on each side of either jaw; they are flat, and have the enamel arranged in the form of transverse plates, which, during the backward and forward movements of the jaw, act antagonistically with the corresponding ridges of the opposed teeth (fig. 42). In order to insure and facilitate this antero-posterior movement, and the converse action, the condyle of the lower jaw is articulated to the skull by a longitudinally-formed socket, which admits of scarcely any lateral motion. There are no canine teeth in the Rodentia; and from the several dental peculiarities here mentioned, it may readily be perceived that the food of these animals must be chiefly of a frugivorous nature, and that it will comprise substances of the hardest character, such as roots, the bark of trees, and even wood itself. Some of the species, however, are omnivorous, feeding on other animals, as well as on various vegetable matters; and in these we find the molar teeth more or less tuberculated. The alimentary canal is of great length, the cæcum being often remarkably large, in some cases exceeding the stomach in size, and filling up the larger portion of the abdominal cavity. A curious exception is seen in the dormouse, where the cæcum is entirely wanting. The form of the stomach in Rodents is sim-

R

ple. These animals are very prolific, and enjoy a wide geographical distribution, being especially abundant in North America. They are not found in Australia. Fossil remains occur in the tertiary formation.

FAMILY I.—SCIURIDÆ.

The Squirrels have simple tuberculated molar teeth, provided with distinct fangs. These molars are usually eighteen in number, but in some instances there are only fourteen. The incisor teeth are smooth, the lower being much compressed. The feet are generally pentadactylous; exceptions, however, occur in the forefeet of certain species, where the thumb is merely represented by a warty tubercle. The limbs are either free, or partially invested by alaform membranous expansions of the skin, which materially increase the leaping power of these animals. The tail is well developed, and more or less tufted with long hairs. The species are numerous—so much so, that we can devote only a very short space to their individual consideration.

THE COMMON SQUIRREL (*Sciurus vulgaris*) is a singularly graceful and attractive little animal (fig. 43). Who has not seen it leaping from branch to branch, and clambering up the sides of many a lofty tree? In

our woodland districts it is everywhere abundant, and its pretty movements may be most advantageously watched in early spring, when the female, with extreme activity, is prettily seeking to evade the pursuit of her attentive lovers, several of which may be giving her chase at one and the same time. "Dwelling principally," observes Mr. Bell, "upon trees, and rarely descending to the ground, it leaps from bough to bough with astonishing agility. It lives upon nuts, acorns, beech-mast, the bark of young trees, leaf-buds, and tender shoots. In eating nuts, it gnaws with considerable rapidity through the hard shell, and then carefully removes every particle of the dry brown skin from each morsel of the kernel before it is eaten. It sits upon its haunches, holding its food in the fore-paws, which serve the office of hands. In taking leaps, when once thrown off by an effort of its long and powerful hinder legs, it is in a measure sustained by the horizontal spreading of its limbs and bushy tail; which latter organ is also extremely useful in covering and protecting the back, over which it is often turned, and in enveloping the whole lateral and dorsal parts of the body when coiled up during sleep or in its hibernation. It lays up stores of food for its winter provision, which is not usually deposited in a single place of safety, but distributed in several different holes of trees, in the imme-

Fig. 43.



The Squirrel (*Sciurus vulgaris*).

mediate neighbourhood of its own retreat. It remains during the greater part of the winter in a state of almost complete torpidity, coming abroad, however, on the occurrence of a fine day, feeding on a part of its treasured hoards, and then retiring again to its slumbers." The general appearance of the squirrel is well known; the length of the body being about fifteen inches,

including the tail, which measures six and a half or seven inches. The head is broad, flattened above and at the sides. The eyes are comparatively large, dark-coloured, and prominent. The ears are well developed, and beautifully pencilled at the tip with long delicate hairs. The fur has a rich brownish-red colour generally, being white under the throat and belly. During

the winter the fur becomes somewhat lighter, or of a greyish tint. The female produces four or five young at a birth, and rears them in a carefully constructed nest. This is formed of vegetable fibres, moss, leaves, &c., and is usually lodged between the fork of two or more branches, so as to be concealed from view; in some instances the nest is made in the hollow of a tree.

THE HUDSON'S BAY SQUIRREL (*Sciurus Hudsonius*) is found in the white spruce forests of Canada, and the northern parts of the United States. In the latter country it goes by the name of the *Chickaree*, on account of the peculiar loud noise which it makes when disturbed in its favourite haunts. It lives upon the seeds and young buds of the spruce, and makes burrows beneath the roots of this tree, where, during the summer, it lays in a large store of fir-cones as provision for the winter; but it remains active throughout the cold season. The flesh is said to be good eating. The fur has a yellowish-brown hue, the central line of the back having a chestnut tinge; but the colouring varies considerably at different periods of the year.

THE BLACK SQUIRREL (*Sciurus niger*) is a large species measuring upwards of two feet when the tail is taken into account. It is also a North American form, being more particularly abundant on the northern shores of Lake Huron and Lake Superior. According to Sir John Richardson, it is likewise tolerably plentiful in the United States. The fur is short, coarse, and of a deep black colour; the ears have an elliptical form, and are devoid of tufts.

THE GREY SQUIRREL (*Sciurus cinereus*) is an inhabitant of the United States, being common in Pennsylvania and Carolina. Like our English species, it lays up a provision of nuts and acorns against the season of scarcity. This species is particularly destructive to

the maize crops, and large numbers are therefore annually destroyed. The grey squirrel is about one-third longer than our form. Its ears are not tufted, and the fur is of an ashy-grey colour generally; underneath the belly, and on the inside of the limbs it is white. The tail is nearly as long as the body.

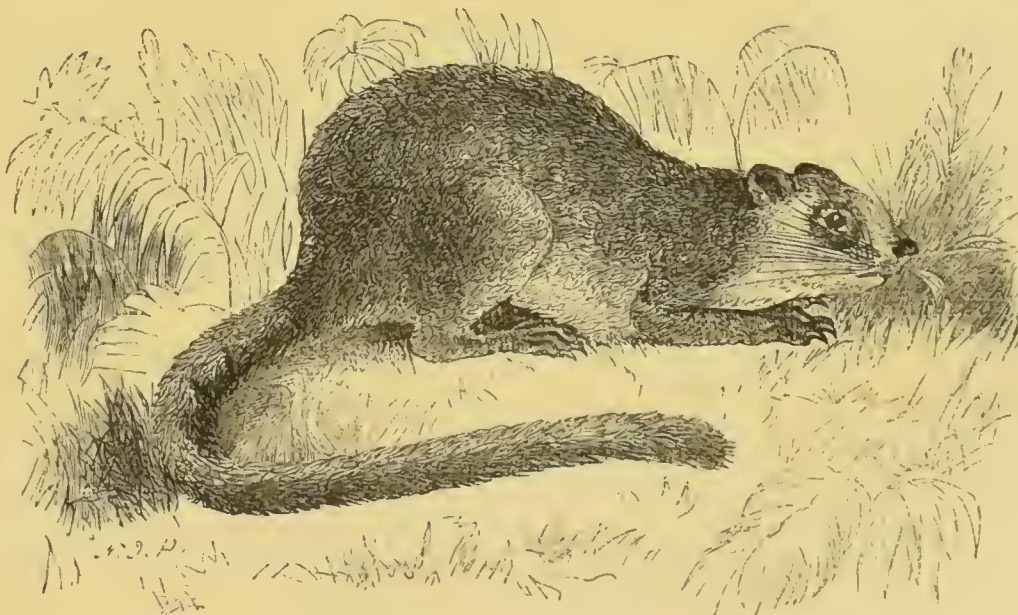
THE WHITE-STRIPED SQUIRREL (*Sciurus getulus*) is a native of the northern parts of Africa, and more particularly of Barbary. The fur exhibits a reddish-grey colour, the sides of the body being banded with two white stripes. It is about the size of our British species, the tail being well developed, and, according to the description given by Pennant, regularly marked with shades of black, one beneath the other. It lives chiefly among palm-trees.

THE MALABAR SQUIRREL (*Sciurus maximus*) is an Indian species, measuring about thirty-three inches, including the tail, which is rather longer than the body. Like the above, it is mostly found among palm-trees, being particularly fond of the cocoa-nut, and the milk which it contains. The fur presents a rich chocolate-brown colour, which subsides into a pale yellowish-brown on the inner sides of the limbs and underneath the belly. The ears are short, and provided with long brush-like tufts.

SMITH'S SQUIRREL (*Sciurus Cepapi*) is a native of Southern Africa, and was originally discovered by Dr. Smith on the banks of the Limpopo river. The fur has an ochreous yellow tint, and is marbled with blackish brown patches. The ears are sharp and blunt above, being also slightly notched near the tip. This species is remarkably shy and agile.

SPARRMANN'S SQUIRREL (*Sciurus bicolor*) is also found in Java, and is, in common with several other species, termed by the natives the *Jelerang*. It is also a native of India and Cochin China. This animal was

Fig. 44.

Sparrmann's Squirrel, or Jelerang (*Sciurus bicolor*).

first described in the Transactions of the Gotheburg Society for the year 1778. The body is three feet long, including the tail, for which about nineteen inches have to be reckoned (fig. 44). The ears are pointed, but not tufted. The fur varies much in colour, being,

in some cases, uniformly black above and of a golden hue beneath; in other instances it is more or less tawny throughout, with patches of a darker tint on the shoulders and hips. It is neither so abundant nor so prolific as the above.

THE BOKKUL (*Sciurus insignis*).—This squirrel inhabits Sumatra and Java, where, from the observations of Dr. Horsfield, it would appear to be a very rare species. The fur has a tawny greyish-brown colour generally, becoming ferruginous at the sides, and white beneath the belly; its most characteristic feature consists in the presence of black bands, which pass from the region of the shoulder to the root of the tail. The body, including the last-named organ, is about thirteen inches long. This species, in common with other allied forms found in India and the adjacent islands, possesses a cylindrical tail; the ears are also short and rounded.

THE BAJING (*Sciurus Plantani*) is likewise a Javanese form, and is extremely abundant everywhere in the island. It was first described by Ljung in the twenty-second volume of the Swedish Transactions. The body is seven inches in length, exclusive of the tail, which rather exceeds this measurement. The fur has a beautifully variegated tawny-brown colour; the inner parts of the limbs and the belly being of a lighter yellow. The tail is banded near its root by several dark rings. The Bajing lives principally among the tamarind and cocoa-nut trees. It is readily tamed.

THE PALM SQUIRREL (*Sciurus palmarum*).—This title is applied to several small species which are abundant in India and Africa, and are found most commonly on palm-trees. They commit terrible ravages amongst the fruit, and though much hunted, do not appear to be at all shy. The general ground colour of their fur is reddish-brown, the surface being generally marked with a varying number of bands; the inferior parts of the belly and the inside of the limbs are pale yellow; dark-coloured rings also occur on the tail. The body is about a foot in length from the tip of the nose to the extremity of the last-named appendage.

THE FOUR-BANDED SQUIRREL (*Sciurus quadrivittatus*) is thus named from the circumstance of its displaying four white lines on the back, these being separated from one another by intervening bars of a blackish colour. The sides of the body are reddish-brown, the under parts being lighter coloured. This species inhabits the wooded districts of North America. It is a remarkably lively creature, and when alarmed utters a chirping note, which often proves troublesome to the hunter when in quest of other animals dwelling in the same localities.

THE GROUND SQUIRREL (*Sciurus Lysteri*), or HACEE, is an elegant little species, characterized by the possession of cheek pouches. It has a brownish-grey fur, subsiding into orange, and becoming white beneath the belly. The sides are also marked by a white band bordered with black, extending from the shoulder to the rump. The tail is comparatively short. The Haekee is a native of North America, being abundant on the shores of Lakes Huron and Superior.

THE ALPINE MARMOT (*Arctomys marmotta*)—Plate 14, fig. 44—is a stout-built animal, about the size of a rabbit, measuring sixteen inches long, excluding the thick-set tail, which gives us six inches more. It inhabits the loftiest slopes of the Alps and Pyrenees, immediately beneath the snow line. The fur has a yellowish-grey colour, becoming brownish-grey about the head. Its food consists of insects, as well as veget-

able matters. Its burrows in the earth have three chambers and two outlets, several retreating into the same hole. When alarmed they utter shrill cries, and also on the approach of storms. The female produces three or four young at a birth.

THE POLISH MARMOT (*Arctomys Bobac*), or BOBAC, is an inhabitant of the smaller hills of eastern Europe and Siberia, extending all the way from Poland to Kamtschatka. The fur exhibits a yellowish-grey colour, the hairs about the head having a russet tint. This species corresponds very closely with the preceding in size and general appearance.

THE SOUSLIK (*Spermophilus citellus*) is a native of Austria, Hungary, Bohemia, and Siberia. It is an attractive-looking species, its greyish-brown fur being prettily marked with small white spots. It belongs to the group of marmots possessing cheek pouches. It is said to have a decided liking for animal food, and will occasionally devour its own species.

THE QUEBEC MARMOT (*Arctomys empetra*) is, as the title implies, a native of Canada. In appearance it closely resembles the bobac, whilst its habits are similar to those of its congeners generally. The fur exhibits a hoary aspect, with shades of brown and black intermixed, passing into reddish orange beneath. The tail is about half the length of the body, and black at the extremity.

THE SHORT-TAILED MARMOT (*Arctomys brachyurus*) is an inhabitant of the plains of Columbia, and is characterized by a brownish-grey fur, variegated with red, this colour becoming more conspicuous underneath the belly. The tail is not shorter than that of several allied species. This animal lives in large companies, a single burrow containing ten or twelve occupants. On being disturbed they utter a shrill whistling cry.

PENNANTS' MARMOT (*Arctomys pruinosus*) is described under the title of the WHISTLER by Harmon and Sir John Richardson. It is a large species; a specimen taken on the banks of the Mackenzie River measuring twenty-seven inches in length. The fur is long, coarse, and of a yellowish-brown colour, the tail being darker and bushy. The Whistler is found occupying the slopes of the Rocky Mountains. The female produces two young at a birth.

THE MARYLAND MARMOT (*Arctomys monax*), or WOOD-CHUCK, is a well-known native of the central districts of the United States, where it is regarded by farmers as a pest, since it proves very destructive to the crops of red clover. The habits of these animals are social and diurnal; for having placed sentinels before their burrows, they wander forth in mid-day to commit their havoc. They are very prolific, the female producing six young at a birth. The fur of the adult has a grey ferruginous colour generally.

THE PRAIRIE MARMOT (*Arctomys latrans*), or WISTONWISH, is another American species, abounding on the banks of the Missouri and its tributaries. The fur is of a reddish-brown colour, the inferior parts being whitish. The tail is short and banded near the tip. When alarmed this creature utters a peculiar barking sound, whence it is often called the prairie dog. Its habits are gregarious, hundreds of them forming a colony, where they construct deep burrows; the entrance to each hole being surrounded by an elevated mound.

Limitation of space prevents our giving full details of the Marmots. Those of our readers, therefore, who desire further information on this head should consult Sir John Richardson's "Fauna Boreali Americana," where they will find a detailed account of the following species of American marmots, unavoidably omitted in this work:—The American Souselik (*Spermophilus guttatus*); the Tawny Marmot (*Arctomys Richardsonii*); the Leopard Marmot (*A. Hoodii*); Say's Marmot (*A. lateralis*); Douglas's Marmot (*A. Douglasii*); Beechey's Marmot (*A. Beecheyi*); Franklin's Marmot (*A. Franklinii*); Parry's Marmot (*A. Parryi*).

In regard to the Squirrels possessing flying membranes, we can only offer the following particulars:—

THE EUROPEAN FLYING SQUIRREL (*Sciuropterus volans*) is only found in the north-eastern parts of our continent, being more abundant in the forests and wild wastes of Siberia. Its habits are similar to those of the common squirrel, feeding, as it does, on the buds of beech-trees and on the seeds contained in fir-cones. During its flying leaps—so much increased in power by membranous expansions of the skin between the fore and hind limbs—the tail is stretched out to aid in steering the body. In a state of repose, this organ is, as usual, gracefully curved over the back.

NIEUHOFF'S FLYING SQUIRREL (*Sciuropterus sagitta*).—This very rare animal—concerning the specific distinctness of which there can be no reasonable doubt—has been carefully described by Pennant. It is a native of Java and other Indian islands, and measures eighteen inches in length, exclusive of the tail, which would give us other fifteen inches. The fur is of a bright bay colour, inclining to orange. During its flying leaps, it is said to employ the tail as a prehensile organ.

THE KECHUBU (*Sciuropterus genibarbis*) is another form of Javanese flying squirrel, measuring, with the tail, about fourteen inches. According to Horsfield it is comparatively rare, and infests the forests of Pugar, one of the most sequestered districts of the eastern portion of Java. Its habits are nocturnal. The fur has a tawny-grey colour generally, the inferior parts being lighter; the texture of the hair is particularly soft and downy.

HORSFIELD'S FLYING SQUIRREL (*Sciuropterus lepidus*) very closely resembles the above, and the distinctions given by Horsfield scarcely seem to warrant its being regarded as a separate species. "It is only found in the closest forests of Java, where the height of the trees and the luxuriance of the foliage effectually conceal it. It is with great difficulty pursued or seized."

THE GREATER FLYING SQUIRREL (*Sciuropterus Sabrinus*)—Plate 14, fig. 43—of North America, is about a foot long, including the tail. The fur has a pale reddish-brown colour generally, being also of very delicate texture. The Rocky Mountain variety so closely resembles it, that, in the opinion of Sir John Richardson, the two kinds ought to be regarded as identical.

THE ASSAPAN (*Pteromys volucella*) is a comparatively small species of flying squirrel. It is very abundant in the United States, infesting the prairies

in large troops. Its tail is about one-fourth shorter than the body, and, as in other allied forms, is flat and distichous.

FAMILY II.—MYOXIDÆ.

The Dormice represent a group intermediate between the squirrels and the mice. The molars are sixteen in number, furnished with fangs, and have their crowns marked with transverse ridges of enamel. The feet are pentadactylous, but the fifth toe of the fore-foot is merely represented by a rudimentary tubercle or warty excrescence. The ears are rounded and oval, and the whiskers well developed. The fur is particularly soft and fine. The tail is very long, hairy, and more or less tufted at the extremity. The food of the Dormice consists principally of vegetable matters; but they also devour beetles, and have been known, in a state of confinement, to eat bats, and even their own young.

THE COMMON DORMOUSE (*Myoxus avellanarius*)—Plate 15, fig. 47.—This well-known little animal, with its ruddy yellow fur, is a great favourite with those who delight in domesticated animals—in which condition it is particularly gentle and docile. It is tolerably common throughout Europe, and dwells in the sequestered parts of dense thickets and plantations. During the summer it lays up a store against the winter, when it falls into a drowsy and torpid state; but on warm sun-shiny days it sometimes emerges from its snug retreat or dormitory. Its habits are nocturnal. In the spring the female usually produces four young, which are blind at the time of birth. According to Mr. Bell, a second brood is occasionally brought forth in the early part of autumn.

THE GREAT DORMOUSE (*Myoxus Glis*) is an inhabitant of Southern Europe, being also found in Georgia and on the borders of the Wolga. It is about the size of our common rat, and has a pale ash-coloured fur, which is white underneath the belly, and at the inner sides of the limbs; the eyes being surrounded by a dark-brown circle. This animal was, in early times, highly prized as a dainty, and was kept by the ancients and fattened in separate hutches expressly for the table. It is still eaten by the Italians. It nestles in holes of trees and rocks, and sometimes attacks small birds.

FAMILY III.—DIPODIDÆ.

The Jerboas are at once recognized by their remarkably developed hinder extremities, although this peculiarity is also seen in a less striking degree in the marsupial kangaroos. The elongation of the hind limbs eminently fits the members of this family for dwelling amongst wild wastes and open plains; and it is therefore in such localities that they are found. Their molar teeth are complex, and in some instances destitute of roots. The hind feet are tridactylous in the true Jerboas, and tetradactylous in aberrant forms. The clavicles are well developed. The eyes are large; the tail is very long, hairy, and frequently tufted at the tip.

THE ÆGYPTIAN JERBOA (*Dipus Ægyptius*)—Plate 14, fig. 45—is extremely common in the country from whence its name is derived. According to Swain-

son, it is a sly and timid animal, living in societies, and constructing burrows underground; and is with difficulty preserved in a state of domestication. Some

naturalists consider this species as identical with the variety found inhabiting the waste country between the Don and Wolga rivers. and in the southern steppes at

Fig. 45.

The Ægyptian Jerboa (*Dipus Ægyptius*).

the Irtitsch; but the limits of our space prevent our discussing this question or giving further details. The accompanying drawing (fig. 45) represents the Jerboa about to take a leap.

MITCHELL'S JERBOA (*Dipus Mitchellii*) has been so named by Mr. Ogilby after the original discoverer, Sir Thomas Mitchell, who found this species on the marshy grounds near the junction of the Murray and the Murrumbidgee, on the northern boundaries of Australia Felix. In size it scarcely exceeds our common field mouse. The tail is particularly long, and ends in a hairy tuft, two inches in extent.

HARDWICKE'S JERBOA (*Dipus Indicus*), is a native of Hindostan, frequenting the cultivated districts, and proving highly destructive to the wheat and barley crops. It feeds principally on grain, but will in times of scarcity consume other kinds of vegetable food. During its leaps, which extend over a space of four or five yards at a single jump, the tail is stretched out horizontally. At evening time hundreds issue forth from their snug retreats, but they disappear on the slightest alarm.

THE CAPE JERBOA (*Helamys Capensis*)—Plate 14, fig. 46—is a native of South Africa. The hind feet are tetradactylous, and armed with very long, sharply-pointed claws. The ears are largely developed; so is also the tail. The molar teeth have no roots; their crowns also are divided into two equal, oval-shaped portions, by a fold from the outer side in the upper series, and from the inner side below. The fur is of a bright yellow-brown colour generally. The Cape Jerboa is a very powerful animal, leaping as much as thirty feet at a single bound. During sleep it assumes a sitting posture.

THE ALAK-DAARGHA (*Scirtetes jaculus*) is the name given by the Mongols to a species of jerboa inhabiting the steppes between the Donau and the Don; this animal is also found in the Crimea. The feet are pentadactylous, but the three central toes of the hinder extremity are very cogently developed. The molar

teeth are rooted, and have their crowns surmounted by contorted ridges of enamel. The ears are fully as long as the head.

FAMILY IV.—MURIDÆ.

The Rats and Mice, properly so called, have largely-developed ears. The clavicles are distinct. There are usually twelve molar teeth, uniformly covered with enamel; and the inferior incisors are compressed and sharply pointed. The fore-feet are tetradactylous, the several digits wide-spread, and the thumb represented by a warty tubercle, which in some cases is clawed; the hind feet are pentadactylous. The skeleton—Plate 33, fig. 106—is comparatively slim throughout. The tail is mostly very long, naked, or only thinly haired. The species are extremely numerous, and abound everywhere.

THE COMMON MOUSE (*Mus musculus*) is almost too well known to require more than a passing notice. The fur exhibits an ashy-brown colour, which becomes lighter underneath the belly. Its ears are about half as long as the head; the tail being rather shorter than the body. This elegant little animal is extraordinarily prolific, the female breeding at all seasons of the year, and usually producing five or six young at a birth. White varieties are very common.

Speaking of the methods adopted for destroying these pests, Mr. Bell remarks as follows:—"In addition to the usual means employed for their extermination, such as traps of various kinds, and the carnivorous instinct of the cat, the ferret, and the weasel, there still exists in Wales a custom so disgustingly cruel that the very mention of it would be scarcely pardonable but for the possibility of thus producing some degree of shame in the perpetrators of it, and consequently saving some poor little mice from being the victims of such barbarity. It is customary in some parts of Wales to roast a mouse alive, hanging it before the fire by its tail tied to a string, that its screams may scare the rest from the house."

As this statement was originally penned some twenty years ago, we indulge the hope that sounder principles of humanity have at length reached the western borders of our isle; and if they have, we shall hail with pleasure any information on this head.

THE HARVEST MOUSE (*Mus messorius*) has a reddish-brown fur above, being white underneath. The ears are comparatively short. The body is only two and a half inches long. The tail is prehensile. This species constructs its nest in the form of a ball, which is suspended amongst rushes, or placed amongst the leaves of some strong wild plant, such as the common thistle. It has been known to devour flies with avidity. Eight or nine young are produced at a single litter.

THE LONG-TAILED FIELD MOUSE (*Mus sylvaticus*) resembles the foregoing in the colouring of the fur, but is distinguished by a brownish spot on the breast, while the ears are much longer, and the tail about the length of the body, including the head. This species proves terribly destructive in our corn-fields; but its diet is not exclusively granivorous, as it has been known to eat young birds, and even its own species. It is rather more than three and a half inches in length, exclusive of the tail.

THE BARBARY MOUSE (*Mus Barbarus*) is an inhabitant of northern Africa. The fur has a dark-brown colour, the sides being prettily marked with five or six yellowish longitudinal bands, which run parallel, and extend from the neck to the rump. Two of the toes on the fore-foot are rudimentary. This species is also known as the Palmetto mouse.

DARWIN'S MOUSE (*Mus Darwini*) is a native of Coquimbo. It measures rather more than five inches in length, not including the tail. The colour of the fur is a mixture of cinnamon and black, the under parts of the body and the feet being white. The ears are very large and nearly naked. The tail is brownish-black superiorly.

THE BLACK RAT (*Mus Rattus*)—Plate 15, fig. 48—is indigenous in Europe. In this country it is not so abundant as formerly, in consequence of the introduction of the brown species, which persecutes and destroys it. It is chiefly distinguished by the greyish-black fur, and by the tail, which is a little longer than the body. The ears are half as large as the head. Its habits are omnivorous. It increases rapidly, the female producing from seven to nine young at a birth.

THE BROWN RAT (*Mus decumanus*) is also termed the Norway Rat, from an old and erroneous notion that it was indigenous in that country. This is now the common species here, and its destructive habits are only equalled by its boldness and ferocity. It is even more prolific than the above, the female producing as many as twelve or fourteen young at a litter.

THE BANDICOOT RAT (*Mus giganteus*) is a huge species inhabiting India, and measuring thirteen or fourteen inches in length, exclusive of the tail. It is a very mischievous beast, undermining houses and places where stores of grain are kept, and also commits great havoc in gardens, besides sometimes attacking poultry. The low east Hindoos are very partial to its flesh.

THE TIKUS-WIROK (*Mus setifer*) is a species of rat inhabiting Java. The fur is of a brownish-black colour,

and is distinguished by "numerous rigid hairs, which are scattered over the upper parts of the body, and project widely from the general covering." According to Dr. Horsfield, it rarely approaches the dwellings of the natives, and is generally found at the confines of woods and forests.

THE AMERICAN FIELD MOUSE (*Mus leucopus*) may be considered as the representative of our long-tailed *Mus sylvaticus*. Sir John Richardson states that this mouse does considerable mischief in gardens, and will destroy an entire plantation of maize in a few nights. The fur exhibits a bluish-brown colour, being white underneath the belly. Specimens, taken from the Columbia river district, measured four and a quarter inches.

THE LABRADOR JUMPING MOUSE (*Meriones Labradorius*) is very abundant throughout the fur countries. The fur has a liver-brown colour above, becoming yellowish at the sides and underneath. The hind legs are very long, and stouter than those in front. The body is about four and a half inches in length, exclusive of the tail, which measures five and a quarter inches.

THE ROCKY MOUNTAIN RAT (*Neotoma Drummondii*) has a yellowish-brown fur, which is white beneath the belly; but it is principally distinguished by a bushy, hairy tail, in which respect we perceive an approach to the squirrel. It lives in crevices of the higher rocks, its food consisting principally of herbage and the twigs of pine trees. The body measures nine inches, exclusive of the tail, which is still longer.

THE HYDROMYS (*Hydromys leucogaster*).—Two varieties have been described, but they are by some considered to be one and the same species. They have been termed, respectively, the white-bellied and the yellow-bellied Hydromys. They are aquatic animals, about twice as large as an ordinary rat. They have only four molar teeth. The hind feet are pentadactylous; the posterior being semipalmate. The tail is remarkably thick at the root, and only thinly haired. These animals are found at Van Diemen's Land, and other islands off the coast of Australia.

THE HAMSTER (*Cricetus frumentarius*) is a well-known European animal, found in various parts of Russia, Germany, and especially in Thuringia, as well as in Siberia. It lives in subterranean holes, where it hoards up large stores of grain. It is torpid during the winter months. The fur is greyish-yellow above, and black inferiorly, and it is marked by three spots on each side; these marks being sometimes light-coloured, and at other times quite black. The Hamster possesses several pouches, and the tail is very short and hairy. The fore-feet are tetradactylous.

THE PHLEOMYS (*Phleomys Cummingii*) is a comparatively large animal from the Philippine islands. The fur has a blackish-brown colour generally, with a reddish tinge on the back. Its length is nearly twenty inches, excluding the tail, which is not so long as the body. The fore-feet are four-toed; the claws being large, compressed, and curved inwards. It was first described by Mr. Waterhouse, in the proceedings of the Zoological Society for the year 1839.

There are many other murine genera and species, for whose consideration we have not sufficient space.

FAMILY V.—ARVICOLIDÆ.

The Swimming Arvicoles or Voles are distinguished from the true mice chiefly by the character of the teeth. The incisors are large, chisel-shaped, and coloured deep yellow in front; the molars have flat crowns presenting enamelled folds, in the form of alternating triangles, on either side. The fore-feet are tetradactylous, with a rudimentary thumb. The muzzle is obtuse, and the ears are not large. The tail is rather short, rounded, and hairy.

THE WATER RAT (*Arvicola amphibia*) has a very close, thick, and shining fur of a rich reddish-brown colour, which becomes paler inferiorly (fig. 46). Its habits are almost too well known to require description. Frequenting the banks of almost every stream, canal, or dyke in this country, it constructs its burrows upwards from the water's edge. "It dives

Fig. 46.

The Water Rat (*Arvicola amphibia*).

and swims with great facility, instantly seeking the water upon every alarm, and plunging at once to the bottom; from whence, however, it is obliged to return to the surface for respiration about every minute. It has often been asserted that the water vole lives upon small fish, earthworms, and insects, and it has even been accused of destroying young ducks. There is not, however," observes Mr. Bell, "the slightest foundation for this opinion." It feeds on roots and various aquatic plants. The female produces five or six young at a single birth.

THE FIELD VOLE (*Arvicola agrestis*), or MEADOW MOUSE, is about four inches in length, exclusive of the tail, which measures rather more than an inch. Its habits are extremely destructive. It feeds on various vegetable matters, grain, &c., and is particularly fond of carrots. It is very prolific, the female producing from five to seven young at a birth. The best method of destroying these pests is by entrapping them in holes excavated in the ground; these pits should be wider below than above.

THE BANK VOLE (*Arvicola riparia*) is, in common with the foregoing, a native of Europe. It is three inches and a quarter long, and the fur is of a bright chestnut red above and greyish beneath. The tail is

about half the length of the body. It is not very abundant in Britain, and but little is known respecting its habits.

THE YELLOW-CHEEKED VOLE (*Arvicola xanthognathus*) is an American species, and is abundant in the neighbourhood of Fort Franklin, and also among the Rocky Mountains, especially in localities where the woods have been destroyed by fire. Its habits are similar to those of the common water rat. Length of the body is from five to eight inches. The females produce seven young at a birth.

WILSON'S VOLE (*Arvicola Pennsylvanicus*) is, according to Sir John Richardson, very abundant from Canada to Great Bear Lake. It infests barns and storehouses, where it hoards up grain and seeds of various kinds; it is said also to be very partial to the bulbs of the Philadelphia lily. The body is about three and a half inches long, the fur being brownish and white underneath.

RICHARDSON'S VOLE (*Arvicola borealis*), or NORTHERN MEADOW MOUSE, is about four and a half inches long, exclusive of the short tail, which measures only an inch. Its habits are similar to those of the Yellow-Cheeked species. It is found in abundance on the borders of the Great Bear Lake. The fur has a chestnut tinge mixed with black; under the belly it is greyish.

THE SCANDINAVIAN LEMMING (*Myodes Lemmus*) is about the size of an ordinary rat. The fur is of a ruddy yellow colour, variegated with black. Its proper residence is among the mountains of Norway and Sweden, but it has a remarkable propensity to emigrate at certain periods. Van der Hoeven remarks, that on these occasions multitudes of them "eat everything bare on the road, like locusts. This usually forbodes a hard winter. The number of these animals thus suddenly appearing in situations where they were previously unknown, gave occasion in former times to the strange opinion that they descended from the clouds." It is sometimes called on this account the NORTHERN MOUSE OF PASSAGE.

THE GREENLAND LEMMING (*Myodes Greenlandicus*)—Plate 15, fig. 49—was first described by Dr. Traill, from a specimen procured by the distinguished navigator, Captain Scoresby. The body is six and a quarter inches in length, the tail measuring only three-quarters of an inch. There are no external ears. The fore-feet are hairy beneath, the digital claws being rounded and sharply pointed. The central line of the back is marked by a dark band. The muzzle terminates in a sharp nose. The eyes are near each other, and comparatively small.

THE HUDSON'S BAY LEMMING (*Myodes Hudsonius*) is scarcely so large as the preceding, and, according to Richardson, is distinguished by the two central claws of the fore-feet being unusually large; they are likewise compressed, "their very blunt extremity being rendered double by a deep transverse notch." Although this species is very easily tamed, very little is known respecting its habits.

BACK'S LEMMING (*Myodes trimucronatus*) inhabits the wooded districts of North America, and is named after Captain Back, who first discovered it on the banks of Point Lake. Sir John Richardson states,

that "in the winter it travels under the snow in a semi-cylindrical furrow, very neatly cut to the depth of two inches and a half in the mossy turf. These hollow ways cross each other at various angles, but occasionally run to a considerable distance in a straight direction. From their smoothness, it was evident that they were not merely worn by the feet, but actually cut by the teeth." The muzzle of this species is blunt, and the nose of a black colour; the fur has a chestnut hue, being greyish underneath.

THE SLEPEZ (*Spalax typhlus*), or BLIND MOLE-RAT, is a very singular animal (fig. 47). It is also

Fig. 47.

The Slepez or Blind Mole-rat (*Spalax typhlus*).

known by the names of Podolian Marmot, Zemni, and *Sfochor Nomon*, the latter name being that employed by the Cossacks. It is characterized by the presence of large incisor teeth, and twelve complex molars. The head is even broader than the body, flat on the crown, and truncated in front. There are no ears; whilst the eyes are almost rudimentary, being represented by tiny specks partly concealed by the fur. The limbs and feet are short, and armed with small claws. The fur is soft, dense, and of an ashy-grey colour, inclining to red. This animal, observes Mr. Broderip, "burrows extensively beneath the turf, driving at intervals lateral passages in its search for roots, particularly that of the bulbous *Charophyllum*. Openings to the surface occur at distances of some yards from each other, and there the earth is raised into hillocks, sometimes of two yards in circumference, and of considerable height. It works stoutly and rapidly, and on the approach of an enemy instantly digs a perpendicular burrow. Though it cannot see, it lifts its head in a menacing attitude towards its assailant, and when irritated snorts and gnashes its teeth, but emits no cry; its bite is very severe. In the morning it often quits its hole, and during the season of love basks in the sun with the female." According to a popular superstition in the Ukraine, any one who has squeezed this animal to death in his hand, and who has been bitten by it in so doing, has conferred on himself the power of curing goitre by merely touching those who are suffering from this disease. The Slepez is about eight inches in length.

FAMILY VI.—CASTORIDÆ.

The Beavers are readily distinguished from all other Rodents by their flattened scaly tail, which in the typical species has an oval outline. The molar teeth are

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twelve in number; they have flattened crowns, the inner border of the upper series being marked by a single enamelled fold, and the outer by three folds; this complicated arrangement is reversed in the lower series (fig. 42). The feet are pentadactylous, the digits of the hinder feet being clothed at the margins by long hairs. The tail is more than half the length of the body, being double-edged towards the free end, and covered throughout with scales and short hairs. The habits of the beavers are aquatic. Fossil remains of several species have been found in various parts of Europe; some of those obtained from the creag deposits in Norfolk and Suffolk differing in several respects from the skeletons of those now living, and being, in the view of Professor Owen, clearly distinctive of a much larger species. There can be no doubt, however, that the Beaver, which, though scarce, is still living in Europe, formerly abounded in Great Britain; and there is every reason to believe that it is identical with the American species, which we have now to describe.

THE COMMON BEAVER (*Castor fiber*)—Plate 15, fig. 50.—This well-known animal is one of the largest, and at the same time the most interesting of all the Rodents, and consequently demands at our hands a more lengthened consideration than any of the foregoing.

The body measures nearly three and a half feet in length, exclusive of the tail, which would give another eleven or twelve inches. Ordinarily the fur has a rich reddish-brown colour; though in some cases it is spotted, in others black, and in a third rare variety quite white. In Europe the Beaver occurs sparingly along the banks of the Rhone, the Danube, and the Weser; but in the northern districts of Canada it is still very abundant in places. At one time such were the multitudes destroyed annually, that it was feared this useful animal would become totally extinct. To prevent this, however, the furriers of the Hudson's Bay Company and certain Indian tribes, have adopted arrangements by which a moderate supply of furs will always be forthcoming, for the manufacture of hats and other articles. The most interesting circumstance in the history of these animals is the extraordinary skill they display in the construction of their dams and dwellings. Many excellent records of their habits, in this particular, have from time to time appeared; but for minuteness and accuracy of detail none have equalled the account given by the traveller Hearne in his "Journey to the Northern Ocean." We shall, therefore, record his observations *in extenso*, which are as follows:—"Where the beavers are numerous, they are found to inhabit lakes, ponds, and rivers, as well as those narrow creeks which connect the numerous lakes with which this country abounds; but the two latter are generally chosen by them, when the depth of water and other circumstances are suitable, as they have then the advantage of a current to convey wood and other necessities to their habitations, and because in general they are more difficult to be taken than those that are built in standing water. They always choose those parts that have such a depth of water as will resist the frost in winter, and prevent

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it from freezing to the bottom. The beavers that build their houses in small rivers and creeks, in which water is liable to be drained off when the back supplies are dried up by the frost, are wonderfully taught by instinct to provide against that evil by making a dam quite across the river, at a convenient distance from their houses. The beaver dams differ in shape according to the nature of the place in which they are built. If the water in the river or creek have but little motion, the dam is almost straight; but when the current is more rapid, it is always made with a considerable curve, convex towards the stream. The materials made use of are driftwood, green willows, birch, and poplars, if they can be got; also, mud and stones intermixed in such a manner as must evidently contribute to the strength of the dam; but there is no other order or method observed in the dams, except that of the work being carried on with a regular sweep, and all the parts being made of equal strength. In places which have been long frequented by beavers undisturbed, their dams by frequent repairing become a solid bank, capable of resisting a strong force both of water and ice; and as the willow, poplar, and birch generally take root and shoot up, they by degrees form a regular kind of planted hedge, which I have seen in some places so tall that birds have built their nests among the branches. The beaver houses are built of the same materials as their dams, and are always proportioned in size to the number of inhabitants, which seldom exceeds four old and six or eight young ones; though by chance I have seen above double that number. Instead of order or regulation being observed in rearing their houses, they are of much ruder structure than their dams; for, notwithstanding the sagacity of these animals, it has never been observed that they aim at any other convenience in their houses than to have a dry place to lie on; and there they usually eat their victuals, which they occasionally take out of the water. It frequently happens that some of the large houses are found to have one or more partitions, if they deserve that appellation; but it is no more than a part of the main building, left by the sagacity of the beaver to support the roof. On such occasions it is common for those different apartments, as some are pleased to call them, to have no communication with each other but by water; so that, in fact, they may be called double or treble houses, rather than different apartments of the same house. I have seen a large beaver house built in a small island, that had near a dozen apartments under one roof; and, two or three of these only excepted, none of them had any communication with each other but by water. As there were beavers enough to inhabit each apartment, it is more probable that each family knew their own, and always entered at their own doors, without any further connection with their neighbours than a friendly intercourse, and to join their united labours in erecting their separate habitations, and building their dams where required. Travellers who assert that the beavers have two doors to their houses, one on the land side and the other next the water, seem to be less acquainted with these animals than those who assign to them an elegant suite of apartments. Such a construction would render

their houses of no use, either to protect them from their enemies or guard them against the extreme cold of winter. So far are the beavers from driving stakes into the ground when building their houses, that they lay most of the wood crossways and nearly horizontal, and without any other order than that of leaving a hollow or cavity in the middle. When any unnecessary branches project inward they cut them off with their teeth, and throw them in among the rest to prevent the mud from falling through the roof. It is a mistaken notion that the wood-work is first completed and then plastered; for the whole of their houses, as well as their dams, are from the foundation one mass of mud and wood mixed with stones, if they can be procured. The mud is always taken from the edge of the bank, or the bottom of the creek or pond, near the door of the house; and though their fore-paws are small, yet it is held so close up between them under their throat that they carry both mud and stones, while they always drag the wood with their teeth. All their work is executed in the night; and they are so expeditious that in the course of one night I have known them to have collected as much mud as amounted to some thousands of their little handfuls. It is a great piece of policy in these animals to cover the outside of their houses every fall with fresh mud, and as late as possible in the autumn, even when the frost becomes pretty severe; as by this means it soon freezes as hard as a stone, and prevents their common enemy, the wolverene, from disturbing them during the winter. And as they are frequently seen to walk over them, and sometimes to give a flap with their tail, particularly when plunging into the water, this has, without doubt, given rise to the vulgar opinion that they used their tails as a trowel with which they plaster their houses; whereas that flapping of the tail is no more than a custom which they always preserve even when they become tame and domestic, and more particularly so when they are startled. Their food consists of a large root, something resembling a cabbage stalk, which grows at the bottom of the lakes and rivers (the plant being, according to Sir John Richardson, the yellow water lily, *Nuphar luteum*). They also eat the bark of trees, particularly those of the poplar, birch, and willow; but, the ice preventing them from getting to the land in the winter, they have not any barks to feed on during that season, except that of such sticks as they cut down in summer, and throw into the water opposite the doors of their houses; and as they generally eat a great deal, the roots above mentioned constitute a principal part of their food during the winter. In summer they vary their diet by eating various kinds of herbage, and such berries as grow near their haunts during that season. When the ice breaks up in the spring the Beavers always leave their houses, and rove about until little before the fall of the leaf, when they return again to their old habitations, and lay in their winter stock of wood. They seldom begin to repair the houses till the frost commences, and never finish the outer coat till the cold is pretty severe, as hath been already mentioned. When they erect a new habitation they begin felling the wood early in summer, but seldom begin to build until

the middle or latter end of August, and never complete it till the cold weather be set in." Further on our author remarks, that "in respect to the Beavers dunging in their houses, as some persons assert, it is quite wrong, as they always plunge into water to do it. I am the better enabled to make this assertion from having kept several of them till they became so domesticated as to answer to their name and follow those to whom they were accustomed, in the same manner as a dog would do, and they were as much pleased at being fondled as any animal I ever saw. In cold weather they were kept in my own sitting-room, where they were the constant companions of the Indian women and children, and were so fond of their company, that when the Indians were absent for any considerable time, the Beavers displayed great signs of uneasiness; and on their return showed equal marks of pleasure by fondling on them, crawling into their laps, lying on their backs, sitting erect like a squirrel, and behaving like children who see their parents but seldom. In general, during the winter, they lived on the same food as the women did, and were remarkably fond of rice and plum-pudding. They would eat partridges and fresh venison very freely, but I never tried them with fish, though I have heard they will at times prey on them." The flesh of the beaver is considered to be a luxury by the Indians, especially if roasted with the skin on. Sir John Richardson says that its flavour is like that of pork, and that it sits heavy on the stomach, requiring strong digestive powers for its assimilation. The female beaver is provided with eight teats, and usually produces about the middle or towards the end of May a litter of from four to eight or even nine young. The voice of the cub resembles the cry of an infant.

THE MUSQUASH (*Castor zebethicus*), MUSK-RAT, or ONDATRA, is a small kind of beaver, having a strong musky odour, which some consider to be pleasant. The body is fourteen inches in length, exclusive of the tail, which measures about nine inches. The hind feet are not webbed. The fur has a ruddy-brown colour generally, being darker on the head and along the central line of the back. The tail is flattish, rounded at the sides, and blunt at the extremity. The Musquash inhabits marshes and lakes, and the grassy banks of sluggish rivers in North America, between the latitudes of thirty and sixty-nine degrees. It feeds chiefly on vegetable matters, but it would appear to be very partial to fresh-water mussels. These animals construct huts on a small scale, somewhat after the fashion of their more powerful congeners, the huts being of simple construction and proportionately small; the interior is lined with dry grass, the aperture of access being under the water. They are much hunted by the Indians, who spear them whilst they are snugly ensconced within their humble dwellings. Several hundred thousand skins are annually imported into England.

THE COYPU (*Myopotamus Coypus*)—Plate 16, fig. 51—is by some naturalists placed among the *Hystricidæ*, but in the arrangement and character of its teeth it corresponds with the beavers. The tail, however, is not compressed, but rounded and hairy; while the fifth toe of the hind feet projects beyond the web-like membrane which conjoins the remaining toes. The

fur has a dusky-brown colour generally, the tip of the muzzle and chin being whitish; whilst a yellow patch occurs on either side of the head immediately beneath the opening of the ear. The Coypu, which is nearly as large as the common beaver, is an inhabitant of the rivers and streams of South America, on both sides of the Andes. It is not exclusively confined to fresh-water lakes and streams, for Mr. Darwin states that it is abundant in the Chonos Archipelago, living in the bays and channels formed by the small and numerous islands of that group. Like the musquash, it appears to be fond of shell-fish. The flesh is said to be excellent eating. By the South American traders the furs are sold under the title of otter skins, several hundred thousand being annually imported into Europe.

FAMILY VII.—HYSTRICIDÆ.

The Porcupines are readily distinguished by the possession of stiff, rigid bristles or quills, similar to those found in the Hedgehogs; their characteristic rodent incisors, however, at once showing the order with which they are properly associated. The molar teeth are sixteen in number; they have flat crowns, marked by undulating lines of enamel, transversely disposed and slightly raised above the dentine. The tongue is rough and armed with horny scales. They have fourteen ribs. The clavicles are almost fully developed, being articulated to the sternum, but only loosely connected to the scapula by ligamentous bands. They have five toes behind, the anterior feet being tetradactylous, and the rudimentary thumb merely represented by a warty tubercle. The Porcupines inhabit the warmer regions, both of the eastern and western hemispheres. They live in burrows, emerging only to feed upon roots, young shoots of shrubs and trees, as well as bark and various kinds of fruit.

THE COMMON PORCUPINE (*Histrix cristata*)—Plate 16, fig. 52—is an inhabitant of Southern Europe and Northern Africa, being, in the former continent, found in Italy, Sicily, and Spain. The body is about two feet long, including the short tail; its colour is grizzled or variegated, owing to the alternating shades of white, brown, and black with which the quills are marked. On the back of the head, the neck, and on the hinder parts, the quills are represented by stiff bristly hairs; those on the tail form hollow horny tubes suspended by slender stalks, which, though originally closed at the ends, become subsequently opened by continual use—the animal delighting to shake them together with the view of creating a peculiar rattling sound. The longest spines are considerably thicker than an ordinary goose quill, and are upwards of twelve inches in length. The habits of the Porcupine are nocturnal, and its food consists of vegetable matters, such as roots, fruits, young shoots, and leaves. During the coldest winter months it hibernates for a short period, retreating within its capacious burrow, which has generally two or more apertures of ingress. Finally, it is almost superfluous to remark, that this animal has no power of shooting its quills, as some have imagined.

THE CANADA PORCUPINE (*Histrix pilosa*) has a tolerably wide distribution in North America, being

found between the latitudes of thirty-seven and sixty-seven degrees. It has been known from the earliest times, and has the credit of being a remarkably sluggish animal. It makes its burrow chiefly among the roots of old trees, and is most abundant in sandy districts, where it feeds upon the bark of the banksian pine and other conifers. On being disturbed, it utters a whining cry. From the observations of Sir John Richardson, it would seem that this species has the power of detaching its quills! "It is readily attacked," he says, "by Indian dogs, and soon killed, but not without injury to its assailants, for its quills, which it erects when attacked, are rough, with minute teeth directed backwards, that have the effect of rendering this seemingly weak and flexible weapon a very dangerous one. Their points, which are pretty sharp, have no sooner insinuated themselves into the skin of an assailant than they gradually bury themselves, and travel onwards until they cause death by wounding some vital organ. These spines, which are detached from the porcupine by the slightest touch, and probably by the will of the animal, soon fill the mouths of the dogs which worry it, and unless the Indian women carefully pick them out, seldom fail to kill them. Wolves occasionally die from the same cause." The flesh of this porcupine is coarse, but appears to be enjoyed by the Indians. The female produces two young at a birth, usually towards the latter part of the spring. The fur has a liver-brown colour, the spines being more or less white.

THE BRAZILIAN PORCUPINE (*Syntheres prehensilis*), or COENDOU, is a native of Guiana, and bears a general resemblance to the above, especially in its habits, which are nocturnal. It is peculiar, however, in presenting a long prehensile tail, which is thinly haired and annulated towards the free extremity. The hind feet are tetradactylous. Like the Canadian species its movements are very sluggish; but it is materially assisted in climbing trees by its tail, which organ is even more usefully employed during its downward progress; it is also no less than eighteen inches in length. The coendou is further characterized by a short abrupt muzzle armed with long white whiskers.

THE JAVANESE PORCUPINE (*Hystrix fasciculata*) is a small species measuring little more than a foot in length, while the tail would add only another four or five inches. This organ has very few hairs on it, their place being supplied by flat blackish scales, arranged in the form of rings; at the tip, however, there is a tuft of long flat bristles, bearing, as remarked by Buffon, a resemblance to narrow slips of parchment cut in an irregular manner, the tuft being about two inches long, and of a white colour. The general colour of the body is that of a dusky-brown. Its habits are like those of its congeners. When irritated it bristles up its spines, and looks capable of resisting almost any enemy. It is not confined to Java, but is found on the Malayan peninsula, and on most of the islands of the Indian Archipelago.

There are many other Rodent forms which have been grouped together into various subfamilies. Of these we need only mention the genera *Cereolabes*, *Echimy*s, *Capromys*, *Aulacodus*, *Loncheres*, and *Cercomys*, which are pretty closely allied. The genera

Oryzeterus and *Bathiergus* are associated together in Dr. J. E. Gray's arrangement—under the family ASPALACIDÆ—the last-named genus being represented by several interesting species. Among these may be mentioned—

THE SHORE MOLE (*Bathiergus maritimus*), which is a native of Southern Africa. It is provided with very large incisors, the upper ones being grooved longitudinally. This peculiarity is not found in those members of the family occupying the sand-hills of the interior. All of the species, however, possess sixteen molars, which have the crowns divided by a transverse line of enamel. They have no ears, very small eyes, and short tails. The fore-feet are furnished with strong fossorial claws, that of the second digit being particularly large. They feed principally on roots.

FAMILY VIII.—OCTODONTIDÆ.

The species included under this head have no true roots to their molar teeth; these organs usually display only a single fold of enamel on either side of their flattened crowns, but in a few instances a second fold is observable on the inside of the lower series. The hind feet are in most cases pentadactylous, but in some tetradactylous. The members of this family, though of small bulk, are comparatively strong, and well adapted for burrowing under ground. They are found in the South American continent, especially in the central and more southern districts. With few exceptions, the whole structure of their skeleton, the form of their skull, and the stout fore-limbs, armed with powerful claws, demonstrate their adaptability to a subterraneous mode of existence.

CUMING'S OCTODON (*Octodon degus*), is a native of Chili, and is sometimes called the CHILIAN SQUIRREL, from the habit it has of scrambling up bushes and low brushwood. The fur has a brownish-yellow colour generally, and is very pale underneath. The ears are conspicuous, rounded, and thinly haired. The thumbs of the fore-feet are only feebly developed; while the claws of all the toes are somewhat concealed by the hair, especially those of the hind feet. The food of these animals consists mostly of herbage, but in times of scarcity they feed upon the bark of species of *mimosa* and *cestrum*. Mr. Darwin states that they may be seen by hundreds in the hedgerows and thickets of central Chili, and that their numerous burrows freely intercommunicate. Their habits resemble those of rabbits, and they prove very destructive to fields of young corn; when disturbed while feeding, they scamper off to the hedgerows with their tails uplifted.

THE SCHIZODON (*Schizodon fuscus*) inhabits the eastern slopes of the southern Andes. The fur has a deep brown colour above, while it exhibits a pale yellowish tint below. This animal was first discovered by Mr. Bridges, who found it in the Valle de las Cuevas, at a height from between five to seven thousand feet above the level of the sea. Its habits are nocturnal, but it seldom comes out of its burrows, which are by preference made in grassy swamps, near to small mountain streams.

POPPIG'S SPALACOPUS (*Spalacopus noctivagus*) is

also an inhabitant of Chili, possessing habits very similar to the above. The fur is glossy, and displays a rich purple-brown and blackish tint. The incisors are smooth and of a pale yellow colour in front. The molars are so uniformly indented on either side, that each resembles a figure of eight. The ears are very small, the tail being particularly short. The claws of the feet are compressed and curved inwards; those of the fore-feet are rather shorter than the toes.

BENNETT'S HABROCOME (*Habrocoma Bennettii*) and another species—*H. Cuvieri*—constitute a distinct genus, which in the structure of the skeleton, approaches very closely to the Chinchillas. The auditory bullæ are remarkably large, while there are no less than seventeen pairs of ribs. The incisor teeth are narrow; the crowns of the superior molars have a single fold internally, those of the lower being angular in form and directed obliquely forward. These animals have rather large and thinly-haired ears. The whiskers are particularly long. The feet are four-toed, and the tail is moderately developed. The fur is very soft and thick.

THE BRAZILIAN CTENOMYS (*Ctenomys Brasilensis*) is an inhabitant of the continent from whence it owes its specific name, and also of La Plata, Paraguay, and Bolivia. The molar teeth are simple, decreasing in size from before backwards; the last has a semi-cylindrical form, that of the upper series being obliquely lunated, with the concavity directed outwards, whilst that of the lower group is oval. The eyes are small, the ears only rudimentary; the tail being rather short and covered with adpressed hairs. The fore-feet are furnished with powerful claws, at the base of which are numerous strong bristle-like hairs directed inwards. Its habits resemble those of the family generally. Several other species are known.

FAMILY IX.—CHINCHILLIDÆ.

The Chinchillas are closely allied to the previous family, having four rootless molars on either side of each jaw, and simple, smooth incisors; the molar teeth being made up of narrow, parallel plates of dentine, transversely disposed and surrounded by enamel. In addition to these characteristic marks, the Chinchillas have their posterior limbs nearly twice as long as the anterior pair. The tail is also much developed, and tufted with long bristly hairs at the extremity. The ears are remarkably large, the internal auditory bullæ being also extensively developed. The clavicles are well formed. The Chinchillas are natives of the South American continent.

THE CHINCHILLA (*Chinchilla lanigera*) measures about nine inches long, exclusive of the tail, which would add some five or six inches more. The fur has an ashy-grey colour generally, being much paler under-

Fig. 48.



The Chinchilla (*Chinchilla lanigera*).

neath. The eyes are large and full, while the broad ears are particularly attractive; the whiskers are correspondingly extensive (fig. 48). The anterior feet are pentadactylous, the internal toe or thumb being very small; the posterior feet have only four digits. The fur is beautifully soft and delicate, and consequently fetches a comparatively high price; multitudes being destroyed annually for the purposes of sale, &c. In regard to its habits, the best account that we have is that given by the Italian naturalist, Molina. "This little animal," he says, "lives in burrows under ground, in the open country in the northern provinces of Chili, and is very fond of being in company with others of its species. It feeds upon the roots of various bulbous plants, which grow abundantly in those parts; and produces twice a year five or six young ones. It is so docile and mild in temper, that if taken into the hands it neither bites nor tries to escape, but seems to take a pleasure in being caressed. If placed in the bosom, it remains there as still and quiet as if it were in its own nest. This extraordinary placidity may possibly be rather due to its pusillanimity, which renders it extremely timid. As it is in itself peculiarly cleanly, there can be no fear of its soiling the clothes of those who handle it, or of its communicating any bad smell to them, for it is entirely free from that ill odour which characterizes the other species of rats. For this reason it might well be kept in houses without annoyance and at a trifling expense, which would be abundantly repaid by the profits on its wool. The ancient Peruvians, who were far more industrious than the modern, made coverlets for beds and valuable stuffs out of this fur." The Chinchillas are fortunately extremely prolific, otherwise they would have been extinct long ago. A

female preserved in the Zoological Society's Gardens, Regent's Park, produced seven young ones at a single litter. From eighty to a hundred thousand skins are annually imported into this country.

THE CHINCHA (*Lagotis Cuvieri*) is about the size of an ordinary rabbit, possessing long ears and a greyish-coloured fur. All the feet are tetradactylous, the digits being furnished with rather small claws; each molar tooth is made up of three laminæ; the whiskers are very long, some ten or twelve of the bristles being particularly stout. This animal lives on the western slopes of the Andes, and has often been confounded with the viscacha, from which, however, it is quite distinct. According to Ulloa's observations, as quoted by Mr. Bennett, the CHINCHAS "conceal themselves in holes of the rocks, in which they make their retreats, not forming burrows in the earth, like rabbits. There they congregate in considerable numbers, and are mostly seen in a sitting posture, but not eating; they feed on the herbs and shrubs that grow among the rocks, and are very active. Their means of escape do not consist in the velocity of their flight, but in the promptitude with which they run to the shelter of their holes. This they commonly do when wounded, for which reason the mode of killing is by shooting them in the head." There is a second species, the *Lagotis pallipes* of Bennett, which closely resembles its fellow. One remarkable peculiarity possessed by these animals consists in the caducous character of their fur; this immediately after death, falls off on the slightest touch, so that, in an economic point of view, the skin is rendered almost valueless.

THE VISCACHA (*Lagostomus trichodactylus*) is also known by the names of BISCACHO and MARMOT DIANA. It lives on the eastern declivities of the Andes, and is quite distinct from the chincha, which occupies the western slopes of the same chain of mountains. Various interesting accounts of the habits of this species have been given by different writers, and more particularly by Darwin, Bennett, and Dobrizhoffer. These records are in general very similar, though differing in a few particulars. Mr. Darwin states that in the evening the Viscachas come out of their holes "in great numbers, and there sit quietly on their haunches. They are, at such times, very tame, and a man on horseback passing by, seems only to present an object for their grave contemplation. They do not wander far from their burrows. They run very awkwardly, and when hurrying out of danger, from their elevated tails and short front legs, much resemble great rats. Their flesh when cooked is very white and good, but it is seldom used. The Viscacha has one very singular habit, namely, dragging every hard object to the mouth of its burrow. Around each group of holes many bones of cattle, stones, thistle-stalks, hard clumps of earth, dry dung, &c., are collected into a heap, which frequently amounts to as much as a wheelbarrow would contain. I was credibly informed," adds Mr. Darwin, "that a gentleman, when riding in a dark night, dropped his watch; he returned in the morning, and by searching in the neighbourhood of every viscacha-hole on the line of road, as he expected, soon found it. This habit of picking up whatever may be lying on the ground

anywhere near its habitation, must cost much trouble. For what purpose it is done I am unable to form the most remote conjecture; it cannot be for defence, because the rubbish is chiefly placed above the mouth of the burrow, which enters the ground at a very small inclination." The fur of the Viscacha has a greyish-dusky colour, the tail is brownish-black, and the face is marked with several black and white bands.

FAMILY X.—CAVIDÆ.

The members of this family, as we propose to retain them, may be fairly subdivided into two minor groups—namely, those which have rooted grinders, and those whose molars are rootless. Some have separated them into two distinct families; but in most particulars they are very closely allied. The molars are sixteen in number, being more or less complicated by laminar plates. The front feet are either three or four-toed, the hind feet being generally tridactylous, and in some cases pentadactylous, with the two outer digits feebly developed. The claws are strong, compressed, and arched. The Cavies are all inhabitants of the South American continent. Their bodies are clothed with short hair; the ears are moderately developed, whilst the tail is either very small or altogether wanting.

THE PATAGONIAN CAVY (*Dolichotis Patagonica*) frequents the desert wastes of the southernmost parts of America, extending as far north as La Plata. It is considerably larger than our common hare, a full-grown example weighing as much sometimes as thirty pounds. The fur presents a mixture of grey and rust colour, the under parts of the head, neck, and belly being white. The molars have no roots; the incisors being smooth and nearly white. The fore-feet are four-toed; the hinder ones, three-toed. The large ears are broad at the base, and more than half the length of the head. The legs are high—a feature by which it ought to be readily distinguished from the hare, but is generally overlooked by uninformed travellers. In regard to its habits, it is, like its congeners, fond of burrowing, and, according to Mr. Darwin, "when found in the same districts with the viscacha, it will avail itself of the excavations of this little animal for a retreat. The Patagonian Cavies wander at times to great distances from their homes, and usually two or three are seen together on these occasions. The animal in its mode of running more nearly resembles the rabbit than the hare, and though its limbs are long it does not run very fast. It seldom squats after the manner of the hare, is very shy and watchful, and feeds by day." The female produces two young at a birth.

THE ROCK CAVY (*Cavia rupestris*) is a native of the rocky districts of Brazil generally. It is likewise found abundant in the higher regions bordering the Rio Pardo and Rio de St. Francisco. It is a taller species than the above, and is remarkable as having the nails of the toes blunt, and so small that they scarcely project beyond the large digital toe-pads with which the feet are also supplied. It has no tail, and the ears are shorter than one half of the head. The flesh is considered good eating.

THE RESTLESS CAVY (*Cavia aperca*) is generally considered to be the originator of our domestic variety of eavy, commonly called the guinea-pig. It is an inhabitant of Brazil, and is found in Paraguay and La Plata. The hairs are brown, with reddish-yellow points, the throat and inferior parts being either white, greyish, or dirty yellow. In the tame varieties the prevailing tint is white, with black and orange-coloured spots. According to Dr. Rengger, this species lives wild, in little societies, varying numerically from six to fifteen individuals. Its principal feeding time is in the morning and evening. In respect of its procreative powers in the domesticated state, few animals surpass it. The female produces from six to twelve young at a litter, and this frequently takes place several times during the year. In six or eight weeks the young are themselves ready to give birth to other offspring.

THE BOLIVIAN CAVY (*Cavia Boliviensis*) occupies only the higher altitudes of Bolivia. The fur has a greyish-yellow colour, being whitish underneath. The incisors have an orange yellow tint. This species is very shy, and, from the statement of Meyen, is believed to be extremely abundant on the lofty plains of Tarna and Tajari. Several other species of cavy are found in Brazil and different regions of South America.

THE CAPYBARA (*Hydrochærus Capybara*) inhabits the banks of almost every river in Brazil, Guiana, and Paragnay, being also found more or less abundant throughout the whole continent of South America. This is the largest species of rodent now existing, the body attaining sometimes a length of four feet. The superior incisors are grooved longitudinally in front. The molars are made up of numerous laminæ, and they are so disposed in the posterior teeth, that Cuvier was led to indicate an affinity on the part of this animal with the elephant—a view which enjoys the sanction of the best comparative anatomists. The head of the Capabara is long, thick, and drawn out towards the muzzle. The feet are slightly palmated; the digits being armed with broad ungular claws. The skin is clothed with long, thin, and scanty hairs; constituting another feature which serves to remind us of the pachydermatous mammals. There is no trace of a tail. According to Maregrave, as recorded by Broderip, this aberrant rodent lives on herbs and fruits. It is a nocturnal animal, swimming across rivers and torrents in search of food, and raising a horrible noise on such occasions. Multitudes of them congregate together on the banks of streams, where they are attacked and destroyed by hunters before they can plunge into the water. Those, however, which succeed in getting into the stream are safe; for though slow of foot, they are expert swimmers. Some writers aver that they are fond of fish; but this seems doubtful.

THE PACA (*Cælogenys Paca*) is a moderately large South American rodent, measuring about two feet in length, and like the foregoing presents some affinities with the pachyderms. The general colour of the fur is dark-brown above and white underneath; the sides being prettily marked with four or five longitudinal rows of white spots, extending backwards from the shoulder to the rump. The Paca is furnished with buccal pouches; the upper lip is cleft, and there is a large

fold of integument on the cheeks. The tail is very feebly developed. The fore-feet are tetradactylous, a rudimentary thumb existing in the form of a clawed warty tubercle; the hind feet are three-toed. The Paca frequents low forests in the neighbourhood of water. It forms burrows which are comparatively superficial, and have three openings. Though heavy-looking and stout-built, it is tolerably swift on foot. Its habits are nocturnal, feeding on fruits and herbage. The female produces a single young one at a birth. The flesh is excellent eating.

THE AGOUTI (*Dasyprocta Aguti*).—The several species of the genus which this animal represents are characterized by tetradactylous feet in front, and tri-dactylous feet behind, and in this particular they correspond with the paca. This rodent is about the size of a hare, and, as a kind of game, seems to supply the place of our "puss" in Brazil, where it is much hunted. The general colour of the fur is yellowish-brown; a mottled or speckled appearance being produced by the hairs in the region of the neck from accumulations of brown, yellow, and black colour. The Agoutis do not construct burrows, but frequent thickets, and when pursued generally seek for holes under old trees, or any place calculated to afford a semblance of security. When captured they utter a plaintive cry, and offer little or no resistance. Their claws being blunt and straight, they are unable to clamber up the trees. These animals are very prolific, the female bringing forth several young at a single birth. Many other species occur in Brazil and the adjoining West Indian islands.

FAMILY XI.—LEPORIDÆ.

The Hares are at once distinguished from the other families of the rodent type, by the circumstance of their possessing four incisor teeth in the upper jaws. Two of these are very small, and are placed immediately behind the anterior pair, so as to present the appearance of double teeth, hence the Hares are sometimes called the *Duplicidentates*. The molars are generally twenty-two in number, six on either side above, and five correspondingly opposed below. They are destitute of roots, and are made up of two distinct laminæ. When the mouth is closed the lower series project inwards beyond the margin of the upper ones. This arrangement being associated with a certain facility of movement of the condyle of the lower jaw at its articulation, not found in other Rodents, it must be evident that the Hares employ a chewing action somewhat similar to that found in the ruminating mammals. The last molar tooth of the superior series is very small. The orbital fossæ are perforated by a common *foramen opticum*. The bony palate is incomplete; whilst, in the typical forms, the clavicles are also imperfectly developed. The soles of the feet are clothed with hair, there being five digits in front, and four posteriorly. The claws are long and narrow. The tail is either short or entirely absent. The Hares have a very wide geographical distribution in the hemisphere, being more particularly abundant in North America.

THE COMMON HARE (*Lepus timidus*)—Plate 16, fig. 53—is familiar to every one in these islands, and is to be met with throughout Europe, except in Norway and Sweden. The general colour of the fur is tawny-grey, inclining to brown on the back, and to a rusty tint lower down; underneath the belly and throat it is white, as well as on the inferior surface of the tail, which, however, is usually directed uppermost. The ears are longer than the head, and more or less tipped with black in different individuals. Respecting its habits, they are almost too well known to need any lengthened record. To the sportsman, hares afford the excitement of the hunt, the amusement of the course, and the pastime of the gun. Of all the various methods employed in destroying these comparatively defenceless animals, perhaps that of shooting them is the least cruel, and therefore the most perfectly legitimate. The barbarities of the slaughter-house, where cattle are daily sacrificed for civilized man's consumption, are not one whit less cruel than the ordinary method employed for destroying game by shooting; and these animals, are "nothing to be refused," if received with thankfulness. While deprecating most sincerely any wanton cruelty in the use of these gifts, we hold the ordinary methods of destroying game to be quite consistent with mercy and humanity; and of one thing we are tolerably certain, that if *man* did not undertake to destroy these defenceless creatures in the usually summary manner that he does, their natural enemies would effect the same result, in ways far less considerate. For example, witness the case of the agonies of the poor hare (seen by the Rev. F. W. Hope, and recorded at page 91) with a weasel sticking to its throat! Witness again the instances where they fall into the merciless clutches of the fox, or even into the penetrating talons of the hawk tribe! Surely a charge of shot, or the sudden gripe of a greyhound, renders the agonies of death less prolonged and less painful than do the natural modes of death above cited. And, if so, why display a false and useless sentimentality in denouncing the conduct of those who, with the gun, cut short the existence of these creatures which are designed to form part of his means of subsistence? Whilst writing these very words, an important batch of game, including "puss," arrives from a friend in the country; and we respectfully beg to inform our readers that we shall allow no qualms of conscience, on the score that these creatures have fallen under the torture of powder and shot, to destroy the satisfaction we hope to derive from their consumption. This, at all events, is a practical view of the question. The hare feeds exclusively on vegetable substances, and causes terrible injury to young plantations, fields of early wheat, and other cereal crops. The habits of the hare are for the most part nocturnal. During the day they rest in open fields and stubbles, and especially in grassy situations. For partial concealment and comfort, they construct superficial hollows in the soil. These excavations are technically termed "forms," and they are more or less perfect, according to the character of the situation chosen. Here they rest in a cat-like crouching manner, with the chin and throat resting on the front paws. Hares are good swimmers, when occasion requires. Thus, in the fifth volume of

Loudon's Magazine, Mr. Yarrell has recorded the following interesting circumstance:—"A harbour of great extent on our southern coast has an island near the middle of considerable size, the nearest point of which is a mile distant from the mainland at high water, and with which point there is frequent communication by a ferry. Early one morning in spring, two hares were observed to come down from the hills of the mainland towards the sea-side, one of which from time to time left its companion, and proceeding to the very edge of the water, stopped there a minute or two and then returned to its mate. The tide was rising, and, after waiting some time, one of them, exactly at high water, took to the sea, and swam rapidly over in a straight line to the opposite projecting point of land. The observer, on this occasion, who was near the spot, but remained unperceived by the hares, had no doubt they were of different sexes, and that it was the male that swam across the water, as he had probably done many times before. It was remarkable that the hares remained on the shore near half an hour, one of them occasionally examining, as it would seem, the state of the current, and ultimately taking to the sea at that precise period of the tide called slack-water, when the passage across could be effected without being carried by the force of the stream either above or below the desired point of landing. The other hare then cantered back to the hills." The female generally produces two young at a litter, but frequently as many as three, four, and even five; the leverets having their sight at the time of birth, and being able to shift for themselves at the expiration of about a month. A full-grown hare weighs eight or nine pounds, but an instance has been given of one which weighed upwards of thirteen pounds. The flesh is usually considered good eating, but in some specimens we have found it decidedly coarse. In cold climates the fur becomes lighter during the winter months. Black varieties also occur in this country; a fine specimen of this kind was shot a few years since on the grounds of Sir Edward Kerrison, of Broom Hall, in the county of Suffolk.

THE ALPINE HARE (*Lepus variabilis*) is a native of the mountainous districts of Northern and Southern Europe. The Alpine hare is rather smaller than the common form, and has a light, fulvous-brown fur, which becomes white on the approach of winter. The ears, however, which are shorter than the head, remain black-coloured at the tips throughout the cold season. The head itself is small, as is also the tail, when compared with that of *Lepus timidus*; the posterior pair of limbs being also shorter.

THE IRISH HARE (*Lepus Hibernicus*).—From a careful examination of several specimens, Mr. Bell considers this hare as specifically distinct from the above. It differs from the common hare in the relative proportion of the ears and head, which are much smaller; whilst it is distinguished from the Alpine species by the size and "form of the body, the tail, and the texture and colour of the fur," the latter exhibiting a uniform rufous-brown tint.

THE AMERICAN HARE (*Lepus Americanus*) is tolerably abundant throughout the more wooded parts of the entire northern continent from which it derives

its specific title. In form, size, and general appearance it very closely resembles our English rabbit; feeding on grass and various vegetable matters, and being particularly fond of willow bark. During the winter, great numbers are destroyed on the banks of Mackenzie river by the Hare Indians, who capture them with snares. According to Sir John Richardson, this species has numerous other destructive enemies, "such as wolves, foxes, wolverines, martens, ermines, snowy owls, and various hawks; but the Canada lynx is the animal which perhaps most exclusively feeds upon it. It has been remarked that lynxes are numerous only when there are plenty of hares in the neighbourhood. At some periods a sort of epidemic has destroyed vast numbers of hares in particular districts, and they have not recruited again until the lapse of several years, during which the lynxes were likewise scarce. In the spring and summer the hares are much infested by a species of *cimex*. In the fur countries this hare becomes white in the winter." In the milder districts the ordinary greyish-brown colour is retained throughout the cold season—a phenomenon which also occurs in the Alpine species. Several thousand furs are annually imported to this country, under the title of rabbit skins, but their value is scarcely sufficient to reward the trouble of exportation.

THE PRAIRIE HARE (*Lepus Virginianus*) very closely resembles our common English species, not only in form and general appearance, but also in its habits and swiftness of foot. It is tolerably plentiful on the plains bordering on the Saskatchewan, and on those of Columbia. In winter the fur becomes pure white.

THE POLAR HARE (*Lepus glacialis*) is a large species, and now very generally considered to be distinct from the Alpine, or varying hare. The fur is quite white, except at the free ends of the ears, which are tipped with brownish-black. Its weight is said to extend to as much as fourteen pounds. The authority above mentioned states, that "although it does not frequent thick woods, it is often seen near the small and thin clumps of spruce fir which are scattered on the confines of the barren grounds. It seeks the sides of hills, where the wind prevents the snow from lodging deeply, and where, even in the winter, it can procure the berries of the Alpine arbutus, the bark of some dwarf willows, or the evergreen leaves of the Labrador tea plant. It does not dig burrows, but shelters itself amongst large stones, or in the crevices of rocks, and in the winter-time its form is generally found in a wreath of snow at the base of a cliff." It does not appear to be at all a shy animal, for Captain Lyon remarks that, while on the coast of Winter Island, the hares went out on the ice to the ships, to feed on the tea-leaves thrown overboard by the sailors. It may generally be approached within shooting distance without much difficulty. During the Arctic explorations of Dr. Kane and other bold adventurers, this little animal formed a frequent addition to their scantily provided feasts.

THE RABBIT (*Lepus cuniculus*) is familiar to every resident in the country throughout Europe. The brownish grey colour of the fur, becoming quite white underneath the tail and belly, associated with a ruddy tinge

about the neck, are characters familiar to all. The ears are nearly as long as the head, but do not present the black markings at their ends, such as we find in the hares. The habits of the rabbit are too well known to require minute detail. Their destructive propensities are so great, that the generality of farmers extirpate them by every means at their disposal. Not only, however, do these little animals afford a considerable source of food to our population, but their skins are so highly valued for manufacturing purposes, that in addition to those procured at home, we have several hundred thousand skins annually imported into this country from Germany. Fortunately the rabbit is extremely prolific; and as it begins to breed at the age of six months, and is capable of producing litters of seven or eight young, six or seven times in the year, Pennant has calculated that in the course of four years, other conditions being favourable, the progeny of a single pair and their offspring, would amount to upwards of a million individuals!

THE LITTLE-CHIEF HARE (*Lagomys princeps*) is the name applied by Sir John Richardson to a small rodent, less than seven inches in length, and which inhabits the Rocky Mountains of North America. The fur is blackish-brown above and greyish beneath; the head being short and thick, and the ears somewhat rounded. It has no tail. "It is often seen at sunset, mounted on a stone, and calling to its mates by a peculiar shrill whistle. On the approach of man it utters a feeble cry, like the squeak of a rabbit when hurt, and instantly disappears, to reappear in a minute or two at the distance of twenty or thirty yards, if the object of its apprehension remains stationary." They do not appear to construct any kind of burrow, but make their habitations among crevices in the limestone rocks. The Little-Chief Hare is distinguished from its congeners in presenting small digital pads at the base and end of its toes; these have a black tint. The claws are also dark-coloured, short, compressed, and concealed by the fur.

THE CALLING HARE (*Lagomys pusillus*)—Plate 16, fig. 54—is a native of the south-eastern parts of Russia and the slopes of the Ural Mountains, as well as of the western side of the Altai chain. The head is long, the ears large, short, and rounded, and the tail absent. The molar teeth are twenty in number; that is, five on either side of each jaw. The body is about six inches only in length. The fur has a greenish-brown colour, being hoary underneath. The Calling Hares frequent sunny banks in the neighbourhood of woods. They form burrows amongst the shrubs and herbage; their openings being difficult to detect, but for the peculiar cry which the occupants make. This noise, which can be heard at a considerable distance, is uttered at regular intervals every morning and evening, and sometimes during the day if the weather be cloudy. The Tartars apply to it the name of barking mouse, while the Cossacks of the Wolga call it *Semlanoi sactshik*, or ground-hare. The young at the time of birth are blind and destitute of fur.

Closely allied to this species is the Ogotona of the Mongols (*Lagomys Ogotona*), which is found to the south of Lake Baikal.

ORDER VIII.—EDENTATA.

THE group of mammalian individuals to which the above title is applied, vary considerably in their skeletal characters, while the ordinal sign by which they are indicated is altogether a misnomer. It is doubtless unnecessary to inform our readers that the term EDENTATA implies that the animals thus called are toothless; nevertheless, in a work like the present, it is not only correct that as few words as possible should remain unexplained, but that when an ambiguous phraseology is, through general acquiescence, adopted, an explanation of its meaning and the cause of its retention should both be satisfactorily explained. We have to remark, therefore, that the Edentata are so called merely from the circumstance that the several species of the order possess neither incisors nor canine teeth; though, indeed, an exception to this rule occurs in the case of two kinds of armadillo, the jaws of which display two incisors above, *i.e.*, one on either side at the posterior part of the intermaxillary bone, and two correspondingly opposed on each side towards the anterior part of the lower jaw; these latter apparently being entitled to come under the same serial category. Be that as it may, if any one doubts this statement let him procure and examine the skull of the six-banded armadillo, or in the event of not being able to procure the cranium, let him turn to the exceedingly accurate figure given in the 212th Plate of Cuvier's "Ossemen Fossiles;" and he will, we are assured, be convinced as to the incisive character of the superior pair just mentioned, from a consideration of the position which they occupy. He will at the same time be satisfied as to the very slender grounds on which the members of the present family are called Edentates. In all of them, we admit, there is a more or less conspicuous deficiency of dental organs at the fore part of the mouth (fig. 49); but, as if further to demonstrate the absurdity of the common title, the molars are in

Fig. 49.



Skull of the Armadillo.

some species remarkably numerous, no less than one hundred small grinders being observed by Frederick Cuvier in the jaws of the great armadillo of Surinam! But without dwelling further on this point, we pass on to notice that the teeth, if considered by themselves, are extremely simple both in their structure and external configuration, presenting no roots at their basal surfaces; this part of their conformation being hollowed out so as to favour a continuous and progressive growth from below upwards. Histologically speaking, they are made up of dentine and cement, and have no enamelled cappings or ridges on their crowns. In regard to the skeleton, striking differences occur in the

various genera, according as to whether they pursue arboreal habits, feeding on vegetable matters, as in the sloths—Plate 34, fig. 112—or, on the other hand, exhibit insectivorous propensities, and do not possess the power of climbing, as in the ant-eaters—Plate 33., fig. 107. Among the most striking of these differences are those which refer to the structure and configuration of the osseous element entering into the constitution of the head, tail, and extremities. Can anything be more significant than the attenuated, narrow, and long cranium of *Myrmecophaga*, and the abrupt, short, and broad skull of *Bradypus*? Observe how conversely the comparison holds good in respect of the limbs—drawn out and armed with long claws in the sloth; shortened and furnished with trowel-like nails in the ant-eater! And, lastly, remark the powerful tail in the last-named animal, while the caudal development of the former is reduced to a mere useless appendage. It is needless to enlarge further on these distinctions, yet we cannot quit this introductory part of our subject without calling attention to the gigantic sloths of a former epoch. The skeletal elements of the *Mylodon* and *Megatherium* exhibit a relative massiveness which utterly throws into the shade any features of a similar kind seen in the stoutest living Edentates, while pachyderm skeletons look slender and feeble in comparison with their monstrous bones! The dwarfish living representatives of that giant race still occupy the swamps and woods of South America; and, whilst not a few of the scaly tribe also occur in the tropical regions of the eastern hemisphere, none of any sort are known to inhabit the continent of Europe.

FAMILY I.—MANIDÆ.

The Scaly Ant-eaters or Pangolins are, in every sense of the term, true Edentates, being altogether destitute of teeth. They have a long, round, extensible tongue, and very small ears, which in some instances are scarcely visible. Speaking generally, their most characteristic feature consists in the possession of an integumentary armature of trenchant, horny, imbricated scales. These are disposed in rows somewhat like tiles on the roof of a house, and when the animals roll themselves up, after the manner of hedgehogs, into the form of a ball, the sharp posterior edges of the scales project like so many points of a cupping lancet, and together constitute a powerful means of defence. Numerous light-coloured hairs project from between the scales. The head is elongated and narrowed in front. The limbs and feet are short, pentadactylous, or tetradactylous, and furnished with curved fossorial claws. The tail is largely developed and of very remarkable strength. The skeleton displays no clavicles, and there is no cæcum in connection with the intestinal canal. The Pangolins are natives of the warmer regions of Asia and Africa. Their movements are comparatively slow; they feed upon various kinds of insects, and more especially upon ants and termites.

THE SHORT-TAILED PANGOLIN (*Manis pentadactyla*), or BADGAREIT, is also known as the Broad-tailed Manis, and is supposed to be the Phattagen described by Ælian. It is an inhabitant of the continent of India and Ceylon, and is the largest species at present living. In the interior of Hindostan the natives apply to it a number of curious names: thus, in the Deccan, it is termed the "tiled-cat;" elsewhere it is called the "land-carp;" and in Ceylon the "negumbo devil." The body approaches four feet in length, including the tail, which is not quite so long as the body and head together. Although this animal is very valuable as a destroyer of white ants and their huge nests, it would appear from the observations of travellers that the Badgareits are frequently subjected to mere wanton cruelty on the part of the Asiatic natives.

THE LONG-TAILED PANGOLIN (*Manis tetradactyla*)—Plate 17, fig. 58—is so named on account of the extraordinary development of the caudal extremity. It is a small animal, about three feet in length at the most; but the tail is twice as long as the body, and contains no less than forty-seven vertebral segments, while in the animal above described there are only twenty-six of these bones. This species, the scales of which are black, and yellow at the margins, is a native of the coast of Guinea.

THE MANY SHIELDED PANGOLIN (*Manis multi-scutata*), or PHATAGIN, has been thus named by Dr. J. E. Gray, from the circumstance that the horny scales forming its dermal armature are disposed in rows varying from nineteen to twenty-one in number; whereas in the two species above noticed, there are only eleven rows. This species, the scales of which are small, of a yellowish-grey colour, and three-pointed posteriorly, is also a native of the coast of Guinea.

TEMMINCK'S PANGOLIN (*Manis Temminckii*) is a native of Southern Africa, being found to the north of Cape Colony, in the neighbourhood of Mozambique, and also in Sennaar. The body is rather more than two feet in length, including the tail, which measures about a foot. The scales are disposed in eleven rows, the last four rows having only four scutes in each, while those of the anterior series have five. It is a scarce animal, its almost total extinction having been brought about by a prevailing superstition among the natives that it has some evil effect upon cattle. Accordingly, when they catch any unfortunate Pangolin, they burn it alive as an offering to the deity, in the hope that some advantage may accrue to their flocks! It is, however, a poor harmless little beast, feeding, like its congeners, principally upon ants.

FAMILY II.—MYRMECOPHAGIDÆ.

Under this head are brought together the Ant-eaters properly so called. They are distinguished from the pangolins by the substitution of an abundant hairy fur in place of the sealy covering above described. None of the typical Ant-eaters display any organs of dentition; but in the aberrant genus *Orycteropus*, we find in young individuals upwards of twenty molars. Usually also the ears are short, rounded, and feebly developed;

but in the particular genus referred to they are long and sharply pointed. The tail is of considerable length in all the species. Another peculiarity of great interest has reference to the feet; for here we notice in the fore-limbs that the ultimate phalanges of the toes, which support the claws, are so constructed as to allow the movements of the latter being restricted to flexion inwards; and in order to maintain this position, there are powerful ligaments which keep the phalanges directed towards the palm, and never allow the digits to be stretched out in the manner of the plantigrade carnivora. The relative size and strength of the toes is also very significant, both in this family and in the preceding; in those which have five toes the central digit attains an enormous bulk, while the outer pair are comparatively small. In order, moreover, to afford adequate power for the digging and burrowing propensities of these animals, the phalanges are all closely connected together up to the base of the ultimate phalange, converting the hand into a sort of trowel similar to that found in moles. From what has been advanced, therefore, it will readily be remarked, that the Ant-eaters do not walk on the soles of their feet; neither do they tread on their strongly-curved toes, which would damage the claws, but, in the fore-feet at least—as may be seen by referring to the drawing of the Great Ant-eater given in Plate 17, fig. 57—the anterior part of the body is seen to rest entirely upon their outer edge; and that part of the hands thus subjected, as it were, to an unusual pressure, is in these creatures supplied with an efficient callous pad to protect the outer phalanges from injury. Another circumstance in the organization of these creatures which has especial claim upon our attention, is the remarkable development of the anterior part of the head, and the more than coextensive elongation of the tongue. In the typical species this organ is rounded, and marked by annulations which indicate the several muscular rings entering into its composition; but in the aberrant genus previously alluded to, the lingual organ assumes a flattened form: in the typical species it can be extended to nearly twice the length of the head. Such, in brief, are the leading characteristics of this singular family; all of them pointing to their insectivorous habits, and demonstrating a special design in their construction and adaptability to the mode of life they lead. Having torn open the habitations of ants and other nest-building insects, the swarming myriads issue forth to give battle to the unceremonious intruder; the slimy and extensile organ is immediately presented to the astonished crowd, who, collecting on the glutinous appendage, are, within less than a second of time, drawn within the capacious maw of the keen and small-eyed myrmecophaga! The typical species seem, in South America—where they alone occur—to represent the sealy pangolins of Asia and Africa; but the single aberrant genus *Orycteropus* is a native of the last-named continent.

THE GREAT ANT-EATER (*Myrmecophaga jubata*)—Plate 17, fig. 57—is a native of Brazil, Surinam, Columbia, Paraguay, and, in short, of all the tropical districts of South America. By the English and Spanish colonists it is known as the Ant-bear; but one would

have supposed that its attenuated head and toothless jaws would have been sufficient to have preserved it from such a misplaced designation. And this leads us to diverge a little from the immediate subject of our description, and to remark how singularly perverse are colonists in all quarters of the globe on the subject of animals. It is in vain that you shall protest that the Great Ant-eater is not a "bear." It is in vain that you shall explain the non-existence of sea-serpents, or prove to demonstration that tigers, properly so called, do not live in Africa! Your Dutch settler, and your English explorer, having met with a "spotted hyæna," or with a "serval," forthwith put it down for a fact that tigers—yes, real tigers!—occur in Africa. Even this very day, while we are writing—24th September—a member of the Livingston expedition records in the *Times* an encounter with a tiger; and thus, with the apparent sanction of those who, we are assured, know better, these false notions are propagated from age to age. But we must return to our edentulous ant-eater. This great species measures about four feet from the tip of the snout to the root of the tail, which, if included, would give us another thirty inches, or upwards of three feet if the long hair at the extremity be taken into consideration. The head alone is about fourteen inches long, being extremely narrowed towards the snout. The eyes are particularly small, and protected by naked lids. The fur is long, and more especially at the anterior part of the back, over the region of the shoulders. The tail is very bushy, the long harsh hairs assuming a bristly character. The general colour of the fur is greyish-brown; but the under part of the chest and throat is black, and from this part there proceeds obliquely upwards on either side a dark band, which, as it passes over the shoulder, gradually diminishes and becomes narrowed to a point over the region of the loins. This black line is also rendered more conspicuous by parallel bars of a whitish tint which embrace it, so to speak, throughout its entire length. According to D'Azara the Great Ant-eater generally invades low swampy grounds, and the banks of rivers and stagnant pools; and although not able to climb, it is frequently found in dense thickets. Its movements are slow, and even when pursued it is easily overtaken by any person on foot. Being very stupid it offers but a feeble resistance, and consequently is easily taken or destroyed. It passes the greater part of its existence in a state of repose, sleeping with the head doubled up underneath the hairy chest, whilst the thick tail is curved over the body to protect it from the powerful rays of the sun. These animals are nowhere very numerous, and consequently have no difficulty in procuring sustenance from the multitudes of ants' nests which abound in the warm parts of South America. The female produces a solitary cub, which she carries about on her back, even after it has attained sufficient growth to shift for itself.

THE LITTLE ANT-EATER (*Myrmecophaga didactyla*) is also known by the name of the two-toed ant-eater, from the circumstance of the fore-feet being didactylous. The hinder extremities are tetradactylous. This species is of very diminutive proportions; the entire body being less than fourteen inches in length, and the tail appropriating more than half of

this measurement. The fur has a pale fulvous colour generally; but it is brownish on the back. The head is much shorter than in the great ant-eater, the snout terminating more abruptly. The skeleton exhibits several peculiarities, but we have only space to mention the remarkable breadth of the ribs. The Little Ant-eater is a native of Brazil and the northern parts of South America. Its habits are similar to those of its more powerful congeners. Von Sack, in his "Voyage to Surinam," gives an interesting account of the tame ones in his possession; and after describing their characters, he tells us that the inhabitants of that country aver, that when captured these animals will not be induced to eat, and only lick their paws after the fashion of a bear. "When I obtained the first," says Von Sack, as quoted by Mr. Ogilby, "I sent to the forest for a nest of ants, and during the interim I put into its cage some eggs, honey, milk, and meat; but it refused to touch any of them. At length the ants' nest arrived; but the animal did not pay the slightest attention to it either. By the shape of its fore-paws, which resemble nippers, and differ very much from those of all the other species of ant-eaters, I thought that this little creature might perhaps live on the nymphæ of wasps, &c. I therefore brought it a wasps' nest, and then it pulled out with its nippers the nymphæ from the nest, and began to eat them with great eagerness, sitting in the posture of a squirrel. I showed this phenomenon to many of the inhabitants, who all assured me that it was the first time they had ever known that species of animal to take any nourishment. The ants with which I tried it were the large termites upon which fowls are fed here." According to Von Sack and most observers, the tail is employed as a prehensile organ. It is, as we have seen, larger than the body, very stout and broad at its origin, thickly clothed with short hairs, and much attenuated towards the extremity. Generally speaking, the fur displays a thick, soft, shining, woolly texture. The female, it is said, produces a single young one at a birth, although it is furnished with four mammae.

THE TAMANDUA (*Myrmecophaga Tamandua*) is, in respect of size, intermediate between the two above-described species; the body measuring upwards of two feet in length from the extremity of the snout to the root of the tail, while the latter organ would give us nearly eighteen inches more. The colour of the fur is subject to considerable variation; and to so great an extent is this the case, that a number of well-marked forms have been recognized, and by some the more noticeable of them have been regarded as so many distinct species. Most, if not all, display a dark band on the fur, running diagonally over the shoulders from below upwards. The woolly hairs are comparatively short, and the tail instead of being bushy at the tip, as in the great ant-eater, terminates in a narrow, sealy, prehensile point. The feeding habits of the Tamandua very closely resemble those of the last-named animal; but it infests the thickest forests of Brazil and the neighbouring districts, living almost exclusively on the trees. It is particularly partial to honey, and proves terribly destructive to the wild and stingless bees which form their nests among the highest branches.

The female brings forth a single cub at a birth. For some months the young preserves a pale-yellow colour, and is carried about on the back of its parent until it is able to shift for itself.

THE AARD-VARK (*Orycteropus Capensis*) or GROUND-HOG, differs from the foregoing in several important particulars. Some of these we have already described in our introductory observations; but we have further to observe regarding the feet, that they are comparatively shorter and stouter than obtains in the true ant-eaters, the anterior pair being tetradactylous, and the posterior pentadactylous. A very distinctive character is seen in the head, which is furnished with large pointed ears; while the tail, being of moderate length, not so long as the body, is very thick, rounded at the root, and densely clothed with hair (fig. 50). Altogether it is a stout, heavy animal, the large bones

of the neck in particular demonstrating its strength in the cervical region. The fur, which is very scanty, exhibits a greyish-brown colour generally. The permanent teeth of the adult, twenty in number, have a simple form and structure, being made up of rootless cylinders, those in front displaying a slightly flattened aspect at the sides. The Aard-vark is a very common animal throughout the southernmost parts of Africa. It is rather larger than the common badger, attaining a length of upwards of four feet. Its habits are nocturnal, and it constructs large subterranean burrows with extraordinary rapidity. It appears to live entirely upon ants, and for this purpose the tongue is largely developed, and armed with a glutinous secretion. This organ, however is not so long as in the true ant-eaters, while it is at the same time more flattened and attenuated. The Aard-vark invariably fixes his retreat

Fig. 50.

The Aard-vark or Ground-hog (*Orycteropus Capensis*).

near to some large ants' nests, which he ventures only to attack after dark. He is a timid creature, and does not move far from his burrow; and when attacked, should he succeed in gaining access to his abode, it is next to impossible to get him out; for it is said he can burrow faster than his enemies can dig. According to those who have witnessed its method of procuring food, the Aard-vark, having approached an ant-hill, forthwith proceeds to scratch a small part of it, just sufficient to allow of the introduction of its long, narrow snout. These ant-hills, it must be remembered, are sometimes three or four feet in height, and contain myriads of insect inhabitants — strongly ensconced in fancied security complete! "Here," observes Mr. Ogilby, "after having previously ascertained that there is no danger of interruption, he lies down, and inserting his long slender tongue into the breach, entraps the ants, which fly to defend their dwellings upon the first alarm, and, mounting upon the tongue of the Aard-vark, get entangled in the glutinous saliva, and are swallowed

by whole scores at a time. If uninterrupted he continues this process till he has satisfied his appetite; but on the slightest alarm he makes a precipitate retreat, and seeks security at the bottom of his subterranean dwelling. Hence it is that these animals are seldom seen, even in those parts of the country in which they are most numerous. Like other nocturnal animals, passing the greater part of their lives in sleeping and eating, they become exceedingly fat, and their flesh is considered to be wholesome and palatable food. The hind quarters particularly, when cut into hams and dried, are held in great esteem."

FAMILY III.—DASYPIDÆ.

Under this title are brought together an interesting little group of animals familiarly known as the Armadillos. We treat of them in this place because they represent a type of structure intermediate between the ant-eaters and the family we have next to consider—

namely, the sloths. The armadillos are readily recognized by their hard coat of mail, consisting of numerous many-sided plates closely soldered together. The individual scales have most commonly a hexagonal form, are osseous in structure, and so combined as to form a series of bucklers completely investing the superior and lateral parts of the body. In order, however, to allow a certain degree of movement, a series of slightly elastic bands, varying in number, are found intersecting the dermal shield at the centre of the back. These zones are partly bony and partly integumentary, the latter structure having a dense pliable, and leathery consistence. The front and upper parts of the head are also furnished with a small shield, the scutes resembling tessellated pavement. The internal skeleton likewise displays several points of interest. The clavicles are well developed, the first rib on either side being remarkably broad. Another peculiarity is seen in the presence of a second spinous-like ridge, projecting from the posterior and outer surfaces of the scapula. This is also seen in the true ant-eaters, but not in the aard-vark. The acromion process of the shoulder-blade is likewise unusually prominent. The teeth have a cylindrical form, and vary considerably in different species. The feet are in some cases all furnished with five toes; but in others the anterior pair are tetradactylous. The under parts of the belly are loosely clothed with a thin fur, whilst a few thin wiry hairs also project from between the scutes of the dermo-skeletal bucklers, and from the soft parts of the semi-elastic zones. The tail is long in a few species, but in others very short. It is usually protected by rings of small scutes, which in certain forms degenerate, so to speak, into mere tubercles, whilst in others this organ is altogether naked. The armadillos are natives of South America; and in that country we find the fossil remains of an allied genus called the Glyptodon, which was a large animal, possessed of immense strength and a proportionately thick and complicated dermal armour. The armadillos feed on vegetable matters, and construct burrows into which they retreat when pursued.

THE PEBA (*Dasypus peba*)—Plate 17, fig. 56—or **BLACK ARMADILLO**, is very abundant in the district of Paraguay; being also found in Guiana and Brazil, but not to the south of the Rio de la Plata. This species has likewise been designated the Long-tailed Armadillo, the Black Tatou, the Tatouhou, and the nine, eight, or seven banded armadillo, according to circumstances; these bands having been regarded as criteria of specific distinctness, and the same animal described as so many separate species. The Peba is not quite a foot and a half in length, exclusive of the tail, which measures other fourteen inches. The head is elongated, and much narrowed towards the snout. The ears are conspicuous, long, sharply pointed, and closely approximated. The limbs are short, and the feet comparatively small. The dermal armature may be divided into three portions, namely, the cephalic, humeral, and iliac bucklers, according to the regions they invest. The two latter are made up of semi-circular parallel rings, whose concavity is directed forwards towards the head, and between them are the

bands which occasionally overlap each other during the turning movements of the body. The molar teeth are thirty-two in number; that is, eight on each side of either jaw. The Peba is an expert burrower, and when pursued its only chance of escape depends upon its gaining access to its dwelling. It is generally found in the more open grounds and cultivated districts. The olfactory powers of this little animal are extremely acute; and as affording an example of this faculty, D'Azara relates the following incident—"My friend Nosedá," he says, "having arranged a trap for the purpose of taking chibigazous, and having placed in it, by way of bait, a cock with a small quantity of maize to support him, it so happened that a few grains of the maize fell through between the boards which formed the bottom of the trap. An armadillo arrived during the night, and wishing to get at the maize thus accidentally spilt, opened a trench or burrow at some distance from the trap, and without deviating a hair's breadth from the straight line of his direction, pushed it on to the very spot where the grain had fallen, and possessed himself of the booty." The food of the Peba and its allies consists principally of vegetable matters, such as maize, potatoes, roots of the mandioc, fallen fruits, &c.; but it also at times partakes freely of animal food in the shape of ants, worms, frogs, lizards, vipers, eggs of birds, dead and half-decomposed carrion of wild cattle—in short, almost anything, including even the contents of human graves when access can be gained to them. Notwithstanding all this, the South American natives and colonists generally, pronounce its flesh to be a real delicacy, especially when roasted in the shell.

THE PICHEY (*Dasypus minutus*) is a very diminutive species of armadillo, measuring only ten inches from the tip of the muzzle to the root of the tail, which latter organ is about half the length of the body. It is an inhabitant of the Pampas lying to the south of Buenos Ayres, extending nearly to the borders of Patagonia. The bands between the humeral and iliac bucklers vary in number according to the age of the animal. Generally speaking, these are either six or seven, each ring consisting of a number of lineally arranged quadrangular plates. The tail is scaly, and tolerably well furnished with hairs. The limbs and claws are of moderate size. The Pichey constructs burrows, but is often seen abroad even during the day, and only occasionally retires into its habitations. In other respects its habits are believed to resemble those of its congeners generally; and in common with the majority of them its flesh is highly esteemed, being exceedingly delicate and well-flavoured.

THE TATOUAY (*Dasypus Tatouay*) is a comparatively rare species found in Brazil and Guiana. It is called the Wounded Armadillo, from a notion entertained by the natives that its tail has been deprived of the osseous covering seen in other species. This organ is about eight inches in length, and is almost entirely destitute of any protecting crust, the naked skin being thinly clad with short brown hairs above, and a few scales on the lower surface. The body is about a foot and a half long, the head being less narrowed anteriorly than in the preceding species. The

molars are thirty in number—fourteen below and sixteen in the upper series. The ears are largely developed, and about two inches from root to tip. One of the most distinguishing characteristics is seen in the enormous enlargement of the digits of the anterior feet. These clearly demonstrate the exalted nature of its burrowing powers; but beyond this little is known of its habits. In the catalogue of Edentata preserved in the British Museum, this species is denominated *Xenurus unicinctus*.

THE POYOU (*Dasypus sexcinctus*) is one of the commonest forms of armadillo, and is especially abundant in the province of Paraguay. It is at once recognized by its remarkable breadth as compared with its height. The body measures sixteen inches from the tip of the muzzle to the root of the tail; this organ being about eight inches long, and protected at the base by three or four osseous plates in the form of rings, while throughout the remainder of its extent it is covered with small scaly tubercles. The limbs, as we have hinted, are very short; nevertheless the animal is very swift of foot. The head is broad, flat, triangular, and truncated at the muzzle; the ears being of moderate size, and widely separated from each other. Its habits are similar to those of its congeners; but as it is particularly fond of carrion, its flesh is not considered by the Spanish and other European colonists of South America to be so good eating, as those species whose diet is exclusively vegetable.

THE HAIRY ARMADILLO (*Dasypus villosus*) is rather smaller than the above, and is a native of Buenos Ayres and the districts south of the Rio de la Plata. So abundant is it in the plains of these regions, that D'Azara writes as follows:—"In an expedition which I made into the interior, between the parallels of 35° and 36° south latitude, I met with vast multitudes of this species of armadillo; so that there was scarcely an individual of the party who did not each day capture one or two at least; for, unlike the Poyou, which moves abroad only during the night, this animal is to be found at all times, and upon being alarmed promptly conceals itself, if not intercepted. In March and April, when I saw them, they were so extremely fat that their flesh surfeited and pallied the appetite; notwithstanding which, the pioneers and soldiers ate them roasted, and preferred them to beef and veal." The distinguished Spanish officer and naturalist further observes, that the Hairy Armadillo "scents the carcasses of dead horses from a great distance, and runs to devour them; but, as it is unable to penetrate the hide, it burrows under the body till it finds a place which the moisture of the soil has already begun to render putrid. Here it makes an entrance with its claws, and eats its way into the interior, where it continues feasting on the putrid flesh till nothing remains but the hide and bones; and so perfectly do these preserve their position, that it is impossible from a mere external view to anticipate the operations which the armadillos have been carrying on within." This species does not construct burrows for the purposes of habitation, and is always met with on dry open grounds. It is, as the name implies, better provided with hair than obtains

in the case of its congeners. The bands vary numerically, there being usually six or seven. The teeth are thirty-two in number, equally divided above and below. The ears are conspicuously developed; but the most characteristic feature of this species arises from the sharp, projecting margin of the lateral bands and tessellated bucklers at the lower part of the body.

THE MATACO (*Dasypus tricinctus*) is another very interesting form of armadillo living in Brazil, Paraguay, and Buenos Ayres. It is also denominated the Bolita, on account of a propensity to roll itself up into a ball. It is nearly as large as the Poyou, excluding the tail, which in the Mataco is reduced to a mere appendage scarcely more than two inches in length. The limbs and feet are rather small and feeble. The head is short, pear-shaped, and armed with a cephalic mail; whilst the bucklers, which are made up of osseous polygonal plates somewhat irregularly disposed, are strongly developed and separated from each other by three broad, movable bands; this latter character rendering the Mataco distinct from all other species of armadillo. The ears are comparatively short and rounded. The Mataco is rather a scarce animal, probably from the facility with which it is captured; for, when pursued, having no burrows wherein to hide itself, and being a slow runner, its only mode of defence consists in rolling itself up into a helpless sphere.

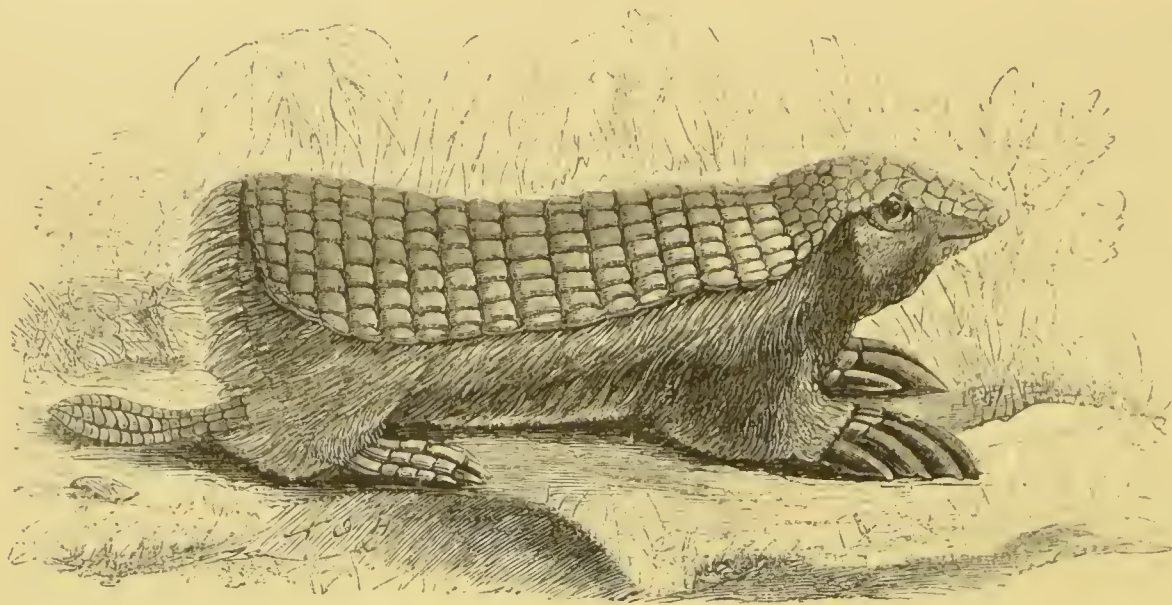
THE GREAT ARMADILLO (*Dasypus gigas*) is not only distinguished by its great bulk, but also by the possession of a multitude of molar teeth, varying in number from eighteen to one hundred. Exclusive of the tail, the body measures about forty inches in length, while the caudal extension would give us some sixteen or eighteen inches more. The ears are small, but the head is more cylindrical than in the generality of species. The humeral and iliac bucklers are made up of numerous rows of square-shaped plates, and are separated from each other by twelve or more movable bands inclosing scutes of a similar character. The long tail is comparatively stout at the base, and is armed throughout with a close-set mail of osseous rings, presenting externally an appearance of spiral lines crossing each other obliquely. The native Botu-eodos employ this dermal armour of the tail to form speaking trumpets, which they use in the densely wood-bound forests of Brazil and Surinam. The digits of the fore-feet are enormously developed, as in the Tatouay, the middle and fourth toes being furnished with large trenchant claws. These digging weapons they employ with such skill and power, that in burying their dead the natives are obliged to place strong barriers of stakes, planks, and stones in order to have a resting-place for their departed companions, secure from the depredations of this gigantic carrion-loving armadillo.

THE PICHICIAGO (*Chlamydophorus truncatus*) forms the type of a remarkably aberrant genus, in many respects closely allied to the true armadillos. It is a native of Mendoza, on the eastern slopes of the Cordilleras, and of other parts of Chili. In point of size it comes very near to the common mole, the body measuring a trifle more than five inches from before backwards. Its anatomy has been very closely investigated by Dr.

Harlan of New York, Mr. Yarrell of London, and Dr. Hyrtle of Vienna; and each of these distinguished naturalists have published lengthened memoirs upon the subject. From their combined descriptions we gather the following particulars:—The molar teeth are thirty-two in number, have a simple structure, and are equally distributed above and below. The head presents the figure of a cone, sharply pointed at the muzzle, and widening out at the occiput; the bones of the skull do not display any trace of sutures in the adult cranium, and over the upper part of the frontal elements there arise two small globular osseous masses, the function

of which will be immediately rendered apparent. Scarcely any trace of an ear can be detected on the outer surface, this organ being represented by a patulous opening, marked by a slightly elevated margin, and situated immediately behind the small, black, half-concealed eyes. The oral opening is not large; but the nose is furnished with an extended cartilaginous septum internally. One of the most striking peculiarities of the Pichiciago consists in the uniform hard dermal armature, protecting the entire length of the head, neck, and back (fig. 51). This coriaceous covering is made up of numerous square, rhomboidal,

Fig. 51.

The Pichiciago (*Chlamydophorus truncatus*).

or enbical plates, closely connected together by a tough leathery development of the epidermis; these plates are disposed in rows, of which there are twenty-four. Throughout the greater part of its extent, this shield is only loosely attached to the body by soft connective tissue; but, along the central line of the back, it is more firmly adherent to the capitals of the vertebral spinous processes, whilst, at the free part of the head, it is very firmly fixed to the two frontal osseous prominences above described. Posteriorly the dorsal shield terminates abruptly, imparting to the hinder quarters an unusual appearance. This part of the body, however, is carefully protected by five semi-circular rings of plates, having a structure precisely similar to those on the back. At the lowermost part, the anal shield is notched for the growth and lodgment of the tail, into which crevice this organ is, as it were, lodged, and is, under ordinary circumstances, doubled up beneath the belly. It presents the character of a rigid cylinder, but at the tip it is flattened out in a spatulate manner, to form a kind of paddle. At the semi-circumferential margin of the anal shield, and along the side of the dorso-cephalic covering, there is developed an extensive fringe of silky hairs, the under parts generally being thickly clothed with fur. All the feet are pentadaetylous, the claws of the anterior pair being remarkably long, slightly curved, and sharply pointed; the several digits are intimately bound together, and are so disposed that

the claws when acting together form a kind of scoop. The hinder extremities are, comparatively speaking, small and feeble, the toes being also more widely separated from each other. Respecting the habits of the Pichiciago very little is known, but from the statements of Mr. Closeberry, the original discoverer of the species, there is every reason to believe that its mode of living very nearly resembles that of our common mole. It dwells almost entirely under ground, its limbs at once showing how unfitted it is for rapid progression on the surface. The female is said to carry her offspring beneath the margins of her dorsal shield; but this statement requires confirmation.

FAMILY IV.—BRADYPIDÆ.

Following Cuvier, some naturalists prefer to consider the Sloths under the family title of *Tardigrada*, as indicating one of the most remarkable characteristics of this tribe of animals. The tardigrades then, or, in simpler phrase, slow-moving Edentates, are at once distinguished by a peculiar conformation of the extremities, admirably fitting them for an arboreal mode of existence, but rendering their movements on the ground very awkward, for the obvious reason that they are unnatural. If we examine the skeleton of an ordinary Sloth—Plate 34, fig. 112—the first thing that strikes us is the unusual size and extension of the limbs, and especially of the anterior pair; the latter are

very nearly twice as long as the hinder extremities, and in this feature we are inevitably reminded of a similar arrangement in the limbs of certain quadrupeds whose habits are in some respects analogous to those of the family under consideration. On closer inspection of the hands, it will be noticed that the bones of the carpus and metacarpus are short and ankylosed together, whilst the terminal digits are long, and furnished with immense hooked claws. These prehensile talons are closely curved towards the palm while not in use, or in a state of rest; but when the animal requires to grasp a fresh branch, they are forcibly extended by muscular contraction, assuming a position like that given in the raised arm of the accompanying representation, above referred to. The hind feet are similarly constructed, and a glance at their position, with the soles directed obliquely inwards, is sufficient to show how unnatural it is to represent a Sloth walking all-fours on a plain level surface. In the older natural history collections of the United Kingdom, nothing is more common than to observe the errors into which taxidermists have fallen in mounting and displaying the stuffed skins of Sloths; and we could still point to fine collections where the tardigrade edentates may be seen sprawling on the floor in the most approved style, with their backs toward the sky! Having personally inspected, with care, the principal museums of natural history in London, Edinburgh, Glasgow, and Dublin, we have no hesitation in saying that, if any one wished to see the way in which Sloths ought to be stuffed, they would do well to take a glance at the specimens preserved in the museum of Trinity College, Dublin—and they are not the only evidences of taxidermal skill to be seen in the Irish capital. But, to return to our skeleton, and the figure reduced from that given in Cuvier's celebrated "Ossemens Fossiles"—let us next examine the head (fig. 52). Here we have a striking contrast when compared with the attenuated crania of the ant-eaters.

Fig. 52.



Skull of the Sloth.

The Sloth's head is short, rounded, flat, and truncated at the muzzle; the jaws are generally furnished with eighteen molar teeth—the anterior pair, above and below, having been regarded by Cuvier as incisors; the young individual carries twenty molars. In the construction of the bones of the trunk, and especially of the pelvis, we notice other interesting adaptations to the peculiar habits of these creatures; but among these we have only space to mention the remarkable elongation

of the neck. This cervical extension was at one time supposed to be due to the presence of nine true neck-vertebræ; but some years since, Professor Bell satisfactorily demonstrated, from prepared skeletons in his own collection, that the so-called eighth and ninth cervical vertebrae were, in reality, true dorsal segments, seeing that he had discovered a pair of little rudimentary ribs attached to each of the osseous elements in question. "The object," says Mr. Bell, "of the increased number of vertebrae in the neck, is evidently to allow of a more extensive rotation of the head; for, as each of the bones turns to a small extent upon the succeeding one, it is clear that the degree of rotation of the extreme point will be in proportion to the number of movable pieces in the whole series. When the habits of this extraordinary animal are considered, hanging as it does from the surface of boughs with the back downwards, it is obvious that the only means by which it could look towards the ground must be by rotation of the neck; and as it was necessary, in order to effect this without diminishing the firmness of the cervical portion of the vertebral column, to add certain movable points to the number possessed by the rest of the class, the additional motion was acquired by modifying the two superior dorsal vertebrae, and giving them the office of cervical, rather than infringing on a rule which is thus preserved entire without a single known exception." As we shall immediately have occasion to return to the consideration of the habits of these animals, we have here only further to observe that the Sloths are all natives of the forests of South America, where they feed upon vegetable matters, chiefly leaves. The extinct genera, *Megatherium*, *Megalonyx*, *Scelidotherium*, *Erinathopsis*, and *Ereptodon*, are also referable to this family, forming the subdivision of *gravigrade* edentates.

THE AI (*Bradypus tridactylus*) or **THREE-TOED SLOTH**—Plate 17, fig. 55—is the best known of all the species. The specific term applied to it rests upon the arbitrarily assumed grounds that it is the only species which is furnished with the three toes; but there is every reason to believe that at least two other Sloths—the *B. gularis* of Rüppell, *B. torquatus* of Illiger, and *B. infuscatus* of Wagler being regarded as so many distinct species—have tridactylous feet. Be this as it may, the generality of naturalists appear content to retain the old Linnæan appellation, and we shall not deviate in the present instance from their combined authority. The Ai inhabits the most secret recesses of the South American forests. The body is enveloped by a coarse shaggy fur, and so disposed about the short round head, as to impart to the physiognomy a human look. The fur has a greyish colour generally, young individuals being frequently spotted with brown and white; the under parts have usually a light fulvous tint. When describing the skeleton, we took occasion to remark somewhat on the habits of this animal, and especially referred to its awkward behaviour when placed on a level surface. One of the most singular errors into which the great French anatomist fell, was that of ascribing to the Ais deficiencies and imperfections of organization, as if they were not well adapted to the mode of existence which the Creator had been pleased

to assign to them. "These animals inhabit trees," says Cuvier, "and never remove from that on which they are located until they have stripped it of every leaf, *so painful to them is the requisite exertion to reach another!*" Our readers are well aware how frequently these errors have been exposed by Bell, Blyth, Buckland, Broderip, Owen, and a host of other distinguished English writers; nevertheless we have pleasure in quoting some apt remarks of the last-named authority, recently given in his manual of the "Skeleton and Teeth." Alluding to the Ai, Professor Owen observes that "it is less able to raise its trunk above its limbs than the seal, and can only progress by availing itself of some inequality of the soil offering a holdfast to its claws, and enabling it to drag itself along. But to judge of the creative dispensations towards such an animal by observation of it or report of its procedure under these unnatural circumstances, would be as reasonable as a speculation on the natural powers of a tailor suddenly transferred from his shopboard to the rigging of a ship under weigh, or of a thorough-bred seaman mounted for the first time on a full blood-horse at Ascot. Rouse the prostrate Sloth, and let it hook on to the lower bough of a tree, and the comparative agility with which it mounts to the topmost branches will surprise the spectator. In its native South American woods, its agility is still more remarkable, when the trees are agitated by a storm. At that time the instinct of the Sloth teaches it that the migration from tree to tree will be most facilitated. Swinging to and fro, back downwards, as is its habitual position, at the end of a branch just strong enough to support the animal, it takes advantage of the first branch of the adjoining tree that may be swayed by the blast within its reach; and stretching out its fore-limb, it hooks itself on, and at once transfers itself to what is equivalent to a fresh pasture. The story of the Sloth voluntarily dropping to the ground, and crawling under pressure of starvation to another tree, is one of the fabulous excrescences of a credulous and gossiping zoology." Such, in brief, is a fair estimate of the capabilities of the Ai in a state of nature; and the testimony of such trustworthy travellers as Stedman and Waterton as to its power of rapid motion under certain circumstances, has long placed the matter beyond dispute. "He travels at a good round pace," says the latter, "and were you to see him, as I have done, passing from tree

to tree, you would never think of calling him a sloth." In conclusion, we may remark, that the female is furnished with two mammae, and produces one young at a single birth, which adheres to the parent by its claws until able to shift for itself. The Ai is much sought after by the natives, who consider the flesh to be excellent eating. When on the move it utters a short plaintive cry resembling our pronunciation, in a shrill voice, of the two-lettered name by which it is appropriately called.

THE GIPAKEIOU (*Bradypus torquatus*) is, like the above, a native of the north-easterly districts of Brazil, but it occurs more sparingly. The fur exhibits a frizzled, ferruginous aspect along the under parts of throat and belly; but above it has an orange-yellow colour generally, whilst the face is black and destitute of hair. A more characteristic feature is seen in the presence of a deep black band, forming a sort of collar round the neck; its specific distinctness being rendered still more certain by differences observable in the structure of the cranium, compared with that of other sloths. The habits of the Gipakeiou closely resemble those of the ai.

THE UNAU (*Cholepus didactylus*), or **TWO-TOED SLOTH**, has been generically separated by Illiger from the above-described species, on account of certain peculiarities in the teeth, associated with a comparative elongation of the head on the one hand, and a shortening of the anterior pair of limbs on the other. The fore-feet are, as above indicated, furnished with only two digits; and the tail, which in the ai is reduced to a mere stumpy appendage, is altogether wanting in the Unau. The first molar teeth of this animal are long, and sufficiently acuminate at the summit to resemble ordinary canines, whilst the superior pair, during the closure of the jaw, are placed in front of the lower ones. Besides these spurious canines, there are fourteen other molars, four on either side above, and three on either side below, the crowns of which are wedge-shaped, that is to say, in their worn condition. In regard to the skeleton, its clavicles are fully developed, and the bones of the carpus and tarsus become very early consolidated together. The Unau is about half as large again as the common ai, whilst the fur exhibits a dark-greyish brown colour generally, being here and there tinged with red. A living specimen of this singular species may be seen in the London Zoological Society's Gardens, Regent's Park.

ORDER IX.—RUMINANTIA.

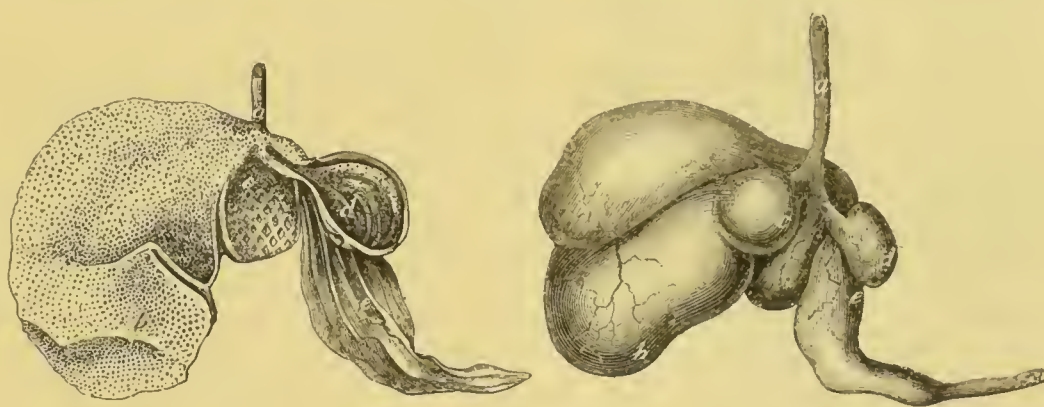
THROUGHOUT the entire mammalian series, there is not a better defined group than that formed by the ruminating quadrupeds here associated together under the above distinctive title. This was the opinion of the greatest of French naturalists, and it is in no degree contra-indicated by Professor Owen, in whose more exacting system of classification—an outline of which is given at page 8—these cud-chewing species collectively maintain their zoological continuity, as a subordinate division of the even-toed ungulates—more precisely called Artiodactyla.

The essential features by which the ruminants may be distinguished are not confined merely to one or two trifling characters, but involve the structure and morphology of several important organs and appendages. In a few words they may be stated as follows:—All the feet terminate in two digits, the ultimate phalange of each being armed with a tightly investing hoof; and the opposed surfaces of these hoofs are flattened in such a way as to impart to the foot an appearance of splitting in the mesial line. With an exception in the case of the camels, all the species are destitute of incisive

teeth in the upper jaw, the vacant space being occupied by a callous pad; the lower jaw is invariably furnished with six incisors, but in all the ruminants not included in the last-named family, the two canines of the lower jaw are closely approximated to the incisors, and, forming a very close resemblance in form and size, are easily mistaken for true incisors. In the typical species, also, there is always a wide unoccupied space intervening between the molars and canines of the lower jaw, while, when the latter are present in the upper maxillary bone, a similar, though somewhat shorter interspace, is correspondingly manifest above. The typical species likewise usually display six molar teeth on each side of either jaw, their flattened crowns being surmounted by two double and irregularly crescent-shaped folds of enamel; the convex outline being directed inwards in the superior series, and outwards below. But the most interesting character by which all the species are noted, consists in the multiple character of the stomach, which is divided into four cavities, so as to provide for the ruminating act (fig. 53). This organ—we say it unhesitatingly—affords one of the most striking illustrations of the special evolu-

tion of a complex mechanism from the general or more simple type of structure seen in the majority of mammalia, whilst, to the mind of an unprejudiced truth-seeker, it irresistibly indicates evidence of creative design: and we hold this argument to be in no way lessened by the easily demonstrated fact, that two if not three of its divisions are essentially modified dilations of the lower end of the œsophagus, A! This is a department of natural history knowledge too important to be slurred over in a work like the present; therefore, before proceeding to explain the ruminating function, we are careful to notice the form and mechanism of this beautifully constructed organism. Most people are aware that the first compartment, B, is called the *paunch*. This is much larger than any of the other so-called stomachs, exhibits a rhomboidal outline rounded at the angles, and occupies no inconsiderable portion of the entire abdominal cavity of the animal. Certain constrictions externally, corresponding with folds of the lining membrane internally, cause this organ, when carefully separated from its other stomachal connections, to assume the appearance of an enormously

Fig. 53.



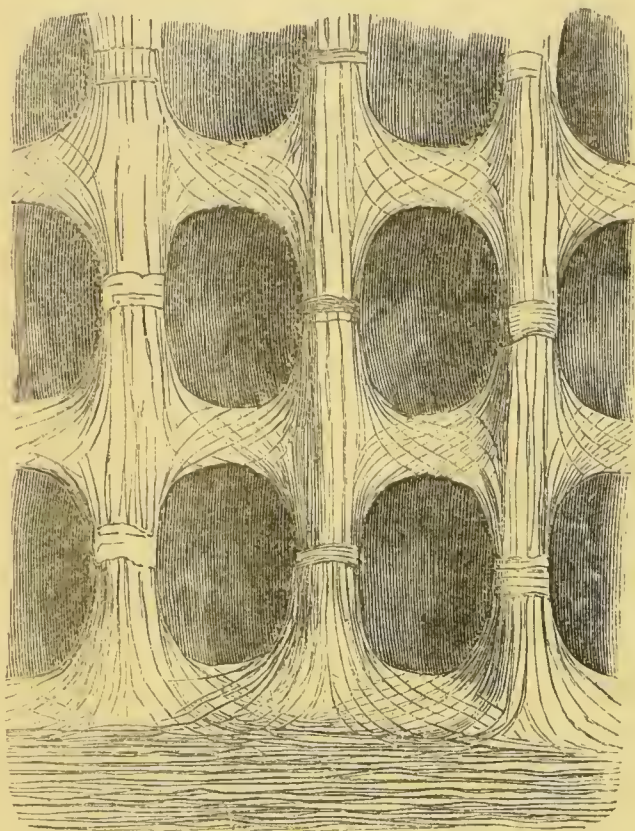
Stomach of the Sheep.

distended coil of intestine, bent upon itself in the form of the letter S. In the typical ruminants the internal surface is closely beset with villous projections, which impart to the membrane a rough, shaggy aspect, the eogeneity of which is variously maintained at different parts of the mucous surface; the villi forming small, flattened, prominent, pedunculated masses, in shape resembling racket bats. Such is the general character of the paunch in ordinary ruminants; but in the aberrant cameline genera we find very material differences. Instead of presenting a rugous internal surface crowded with these baton-like villousities, the mucous lining membrane is conspicuously smooth. The most remarkable feature, however, arises out of the formation of numerous pouches, specially fitted for the reception and retention of water (fig. 54). These sacs, which may be looked upon as so many protrusions of the wall of the viscus, are arranged in two distinct groups, one on the right side and the other on the left; the former being by far the more numerous, and, in the full-grown dromedary, measuring about one foot and a half in length and six inches in breadth. The cells of each group are disposed in parallel rows, separated from one another by strong muscular bands, given off from a single large bundle of fibres, which commences at the upper extremity of the

paunch, and proceeds in a longitudinal direction, so as to divide the cavity into two compartments. The muscular fasciculi are arranged transversely, and give off secondary bundles at tolerably regular intervals, so that the rounded orifices of each cell are guarded by powerful square-shaped muscular lips. Some of the pouches are more complicated than others, being subdivided into numerous smaller bags by foldings of the internal lining membrane. The largest of the reservoirs in the adult dromedary have, when distended, a depth and width of about three inches. A structure analogous to this is found in the llamas; but it is not so strongly developed. This leads us, in the next place, to describe the second stomach of the ruminants, otherwise called the *reticulum* or water-bag, C (fig. 53). This organ has been regarded by some as a mere appendage of the paunch; but it is as much entitled to a distinctive recognition as any other of these connected viscera. In respect of size, it is comparatively small, presenting a globular outline, and forming a sort of cul-de-sac between the first and third stomachs. Its most characteristic feature is seen in the presence of multitudes of polygonal cells, from which circumstance it has been popularly called the honey-comb bag. In some species, as, for example, in the rein-deer and giraffe,

these cells are limited by very narrow walls of separation, scarcely elevated above the level of the general surface; and in the horned ruminants the mucous surface is further characterized by a great number of minute and sharply-pointed conical papillæ, occupying every part of the cavity; being most prominently marked along the ridges of the laminae, so as to give to these slightly-elevated folds of separation a toothed margin. In the camels and llamas the honey-comb cells acquire a form and capacity strictly analogous to the water-cells of the paunch; but there are some slight structural modifications apparently conformable with

Fig. 51.



Water-cells in the paunch of the Camel.

the more temporary or immediate purposes which they subserve. The apertures of the cells of the paunch, which have been designed to retain water for a lengthened period, are narrow and guarded by productions of the lining membrane, whilst those of the second stomach—destined to be continually parting with their aqueous contents during the ordinary act of rumination—are patent, and not covered in by special membranous folds. Moreover, in the distended state of the cells, the external surface of the paunch is marked by a corresponding number of vesicular bulgings, whereas, in the reticulum, the walls remain uniformly smooth, and do not exhibit on the outside any marked traces of the internal water-cells; nevertheless the compartmental subdivisions are more numerous and complicated than those of the first stomach. Another distinction between the ordinary horned and the non-typical hornless ruminants, may be seen in the absence of any internal cuticular lining membrane in the reticulum of the camels. But we must now pass on to notice the third stomachal viscus. Before doing this, however, we have to remark, that in all ruminants there is situated a short trough-like canal at the superior

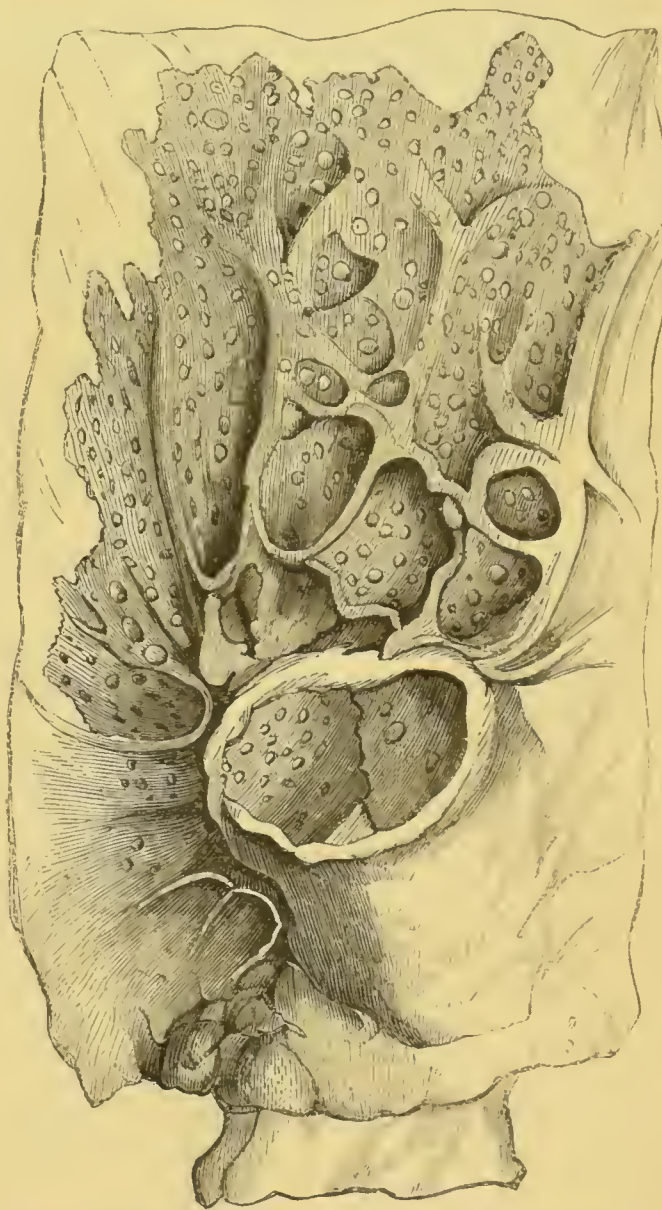
and anterior margin of the reticulum, constituting the remains, as it were, of that portion of the gullet which has not, according to the developing theory, become involved in the first and second great gastric dilatations. This grooved channel forms a bond of intercommunication between the oesophagus and the three first digestive cavities, and it is furnished with an extension of the muscular tunics of the gullet, so as to fit it for a two-fold office to be presently described. The third stomach, or *manyplies*, D (fig. 53), intervenes between the reticulum and the fourth or true digestive cavity; communicating with the former by a minute aperture, and with the latter by a very wide opening. It is the smallest of the four great stomachal organs; but the extent of its absorbing mucous surface bears no relation to its diminished bulk, seeing that the latter is enormously increased by a remarkable folding of the internal lining membrane whose duplicatures resemble the leaves of a book, whence it is sometimes called the *psalterium*. The leaf-like folds are disposed lengthways, and in the empty condition of the organ are closely applied against each other. In breadth they exhibit proportionate differences, so that we find an alternating assemblage of laminae presenting three gradations of development; one forming a very narrow fold, another very broad, and a third of intermediate width, serially intercalated between the two. Altogether about forty such septa may be counted in the sheep, and more than double that number in the ox. Internally the surface is beset throughout with small conical eminences, similar in character to the villi of the reticulum; those occupying the free margins of the folds being more conspicuously developed. The *manyplies* is much elongated in the camels, and considerably larger than the water-bag of the same aberrant group. In all ruminants the fourth stomach, E (fig. 53), constitutes the true digestive cavity, being functionally and morphologically analogous to the simple gastric organ of the non-ruminating mammalia. This viscus is about one-third of the size of the paunch, smooth externally, pyramidal in shape, and terminates by a narrow tubular portion at the inferior or pyloric extremity, at which position the muscular walls acquire increased thickness. Internally the secreting membrane is marked by irregularly disposed longitudinal folds, slightly elevated above the surface, and intercommunicating by smaller foldings of the same nature, having a more or less oblique direction. The lining membrane is soft and smooth, and instead of being provided with villous appendages, is furnished with minute follicular openings leading to gastric glands like those of the human stomach. At the pyloric extremity, in addition to the ordinary narrowing usually seen at this part, there exists a special valvular process, developed from the mucous membrane at the commencement of the duodenum—this structure being evidently designed to guard more effectually the entrance to the intestinal passage. At this point, therefore, we are naturally led to explain the function of rumination, which is characterized by the following phenomena as they successively follow each other under ordinary circumstances:—The food, on being received into the mouth, undergoes a very partial mastication, and in this crude state is speedily

carried down the gullet, where, on arriving at the lower part, the lips of the muscular channel, placed at the entrance of the first three stomachs, separate so as to insure its passage into the paunch. In like manner, subsequent to the act of drinking, the margins of the œsophageal groove open, and the water is conveyed into the cells of the reticulum. In the camels a part of the fluid passes into the first cavity, there to be retained by the great water-cells, as a special provision against those contingencies which their mode of existence involves. While the coarse vegetable food is being macerated by the moisture secreted from the walls of the paunch—and probably also from the water taken in by the mouth, some of which may have entered the cavity—portions of the indigestible mass are transmitted into the second stomach for further maceration, and from thence into the grooved canal above described, to be here moulded into the form of pellets, and returned to the mouth by a kind of reversed peristaltic action. The softened bolus thus brought back into the mouth, is destined to receive a thorough and complete remastication, constituting that part of the process familiarly termed “chewing the cud.” This phenomenon is accompanied with an action of the jaws which differs somewhat in particular species. Thus, it has been shown by Professor Owen that in the camels the bolus is triturated alternately from side to side; whereas the action of the teeth in the horned ruminants, including the giraffe, is always in one direction—it may be from right to left or left to right—occasioned by the rotatory motion of the jaw. The necessary reduction of the aliment having been accomplished, it is again transferred to the stomach in a pulpy semifluid condition; but this time, instead of entering the first or second cavities, it passes directly along the now-closed œsophageal groove into the third stomach, or manyplies. In this viscus the superfluous moisture is supposed to be absorbed before the bolus is ultimately transmitted into the fourth stomach, in which organ the true digestive act remains to be fulfilled. In the newly-born ruminant, the first, second, and third stomachs are very incompletely developed; and no chewing of the cud being necessary, the food passes uninterruptedly into the fourth. In the calf a peculiar organic acid is secreted by the lining membrane of the true stomach, which, it is well known, possesses the singular power of converting the albumen of milk into curd and whey. In the young, as well as in the adult animal, various foreign substances are occasionally found in the paunch, and sometimes in the reticulum. The concretionary masses are either made up of hair, vegetable fibres, or calcareous particles, generally agglomerated together in a rounded or oval form. The hairy balls found in the calf and cow result from the licking of their own hides, or those of others; and the individual hairs, on being transferred into the stomach, are collected together, and rolled by the action of this organ into the characteristic shapes above mentioned. In the camel we find them in the form of pedunculated pellets, strung together in grape-like bunches. In the chamois, the formation of the so-called bezoar stones, takes place in consequence of a partiality for saline matters, which the animal gratifies by licking fragments

of rock containing saltpetre. Thus a variety of earthy and silicious particles are at the same time swallowed, and by the secretions and peristaltic action of the stomach, are agglutinated together, and converted into curious pebble-like formations.

Before leaving this part of the subject, we deem it right to notice our discovery of two very remarkable peculiarities occurring in the alimentary canal of the aberrant genus *Camelopardalis*. The first of these consists in the presence of pouch-like folds in connection with the compound glands of the intestine; whilst the second is a similar, but far more striking development of the glands, situated close to the opening by which the small intestine communicates with the large colon and cœcum. This structure we believe to be altogether unique throughout the entire mammalian series; and although we first directed attention to it at the Glasgow

Fig. 55.

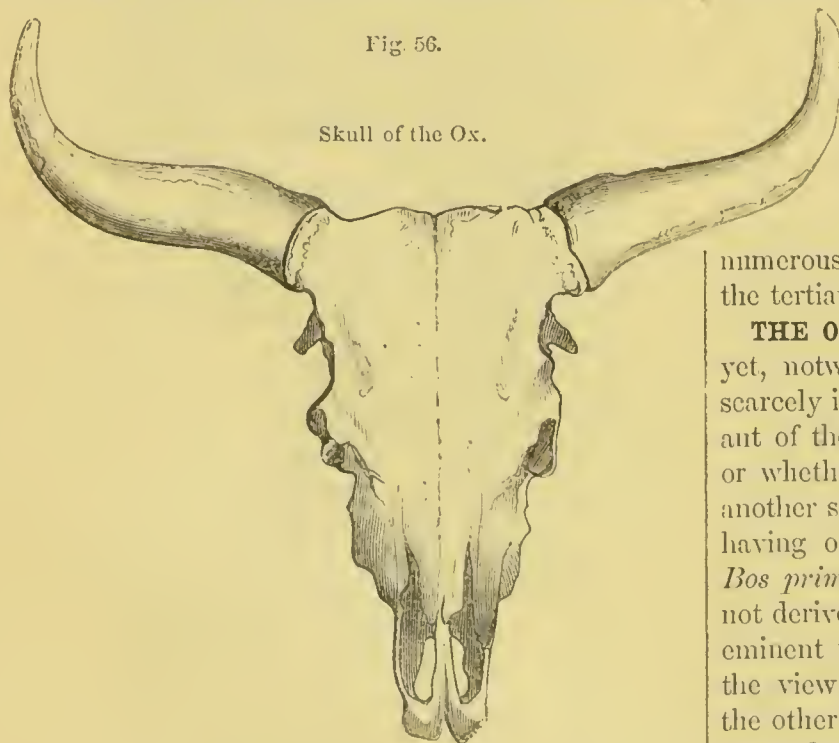


Remarkable compound gland situated at the junction of the large and small intestines of the Giraffe.

meeting of the British Association in 1855, and have subsequently given details in the third volume of the new series of the *Edinburgh Philosophical Journal*, and in the article “Ruminantia,” published in Dr. Todd’s “Cyclopædia of Anatomy and Physiology,” we make no apology for again specially inviting the atten-

tion of naturalists to so interesting a structure (fig. 55). Here we have an intestinal gland, made up as it were of from fifteen to twenty little pouches, combined to form a beautiful network of cells, seven of them bearing no inconsiderable resemblance to the water-carrying reservoirs of the reticulum. These latter have a depth of from three to four lines, whilst the remainder are more or less incomplete; and those farthest from the ileo-colic orifice are mere depressions, the walls of separation being scarcely elevated from the surface. In other ruminants the only peculiarity affecting the alimentary canal, which is worthy of notice, consists in the remarkable lengthening of the intestinal tube generally, and in the bulky development of the cœcum. There are some curious modifications of structure to be seen in the liver and gall-bladder; but these distinctions will be more appropriately indicated when comparing and describing the several characteristics of the cameline and cervine families.

The skeletal characters are tolerably uniform throughout the order, except in so far as they relate to mere size and strength, and to the presence or absence of those remarkable cranial outgrowths, commonly called horns. We shall treat of the latter structures when specially considering the horned families. Meanwhile we take occasion to notice, that whatever be the length of the vertebral column, we invariably find the bones of the neck to be only seven in number; and the beauty of this law, though previously mentioned as affecting the entire mammalian series, cannot be more cogently illustrated than by comparing the long-necked camels and giraffe with the short-necked cetacea—which have yet to be described. Taking the skull of the ox (fig. 56) as a type of the ruminant cranium, it



is only necessary to observe its general breadth and massiveness; the cerebral division bearing a very small proportion to the entire mass. This disparity prevails throughout the whole order, the bones of the face occupying fully two-thirds of the entire length, and the area of the face on section being nearly double that of the cranium.

FAMILY I.—BOVIDÆ.

The group of animals commonly termed Oxen constitute a division of the hollow-horned ruminants, which, although very closely allied to the sheep and antelopes, are easily recognized by their bulky and massive appearance generally, and particularly by their broad muzzle and powerful limbs. A still more striking characteristic is to be seen in the lateral direction of the horns, which usually incline upwards, or forwards in a crescentic manner. In the constitution of the skeleton, there are numerous variations in the form, position, and degree of development of the several osseous elements; but these are not of sufficient importance to be detailed at length. In regard to the cloven hoof, we may mention what we have omitted in our general introduction to the order, namely, that this split condition of the foot is evidently designed to impart lightness and elasticity to the spring; and in view of giving full effect to such an arrangement, many ruminant species are provided with a special glandular sebaceous follicle between the toes, whose office it is to furnish a lubricating secretion, calculated to prevent injury from friction of the digits one against the other. According to Sir Charles Bell, there is yet another intention in this cloven form, viz., that of aiding the voluntary elevation of the foot, when it has sunk deeply into the soft ground. "We may observe," he says, "how much more easily the cow withdraws her foot from the yielding margin of a river than the horse. The round and concave form of the horse's foot is attended with a vacuum or suction as it is withdrawn, while the split and conical-shaped hoof expands in sinking and is easily extricated." In regard

to the economic purposes which this family subserves, they are not second to those of any other group of animals, for they supply us with capital in the form of labour, fat, milk, leather, horns, &c. Geographically, they enjoy a wide distribution, both in the eastern and western hemispheres; whilst numerous fossil remains testify to their abundance in the tertiary epoch.

THE OX (*Bos taurus*) is known to every one, and yet, notwithstanding our familiarity with it, we are scarcely in a position to decide whether it is a descendant of the great ancient British wild ox—*Bos urus*—or whether it may not be a domesticated variety of another species. We incline to the latter opinion; and having ourselves carefully examined the cranium of *Bos primigenius*, we are quite satisfied that the Ox is not derived from *that* source. Cuvier, Bell, and other eminent naturalists have expressed their opinion that the view first referred to is the correct one; but, on the other hand, we have the weighty authority of Professor Owen, whose sentiments are thus convincingly expressed:—"It seems to me more probable," he says, speaking of our domestic cattle, "that the herds of the newly-conquered regions would be derived from the already domesticated cattle of the Roman colonists; of those '*boves nostri*,' for example, by comparison with which Cæsar endeavoured to convey to his countrymen an idea of the stupendous and formidable uri of the

Hereynian forests. The taming of such a species would be much more difficult than the importation of the breeds of oxen already domesticated and in use by the founders of the new colonies. And that the latter was the chief, if not the sole source of the ox of England, when its soil began to be cultivated under Roman sway, is strongly indicated by the analogy of modern colonies. The domestic cattle, for example, of the Anglo-Americans have not been derived from tame descendants of the original wild cattle of North America; there, on the contrary, the bison is fast disappearing before the advance of the agricultural settler, just as the auroch (*Bison priscus*) and its contemporary the urus have given way before a similar progress in Europe." Professor Owen believes that no living descendant of *Bos urus* exists on the habitable globe, and that it is only known to us by its fossil remains; but there is reason to suppose the auroch and European bison to be identical. Be this as it may, the common ox is specifically recognized among existing forms by its flat forehead; the horns being placed at the two extremities of a prominent crest, which separates the forehead from the occiput. All our domesticated cattle—so widely scattered over the face of the earth—are derived from this species; the various celebrated breeds representing so many more or less permanent types of variation. Oxen, although usually slaughtered for food before many years have elapsed, are capable of attaining an age of twenty-five years and upwards. It is somewhat singular that the cow should have a period of gestation precisely equal in duration to that of the human female, namely, two hundred and eighty days. The calf at the time of birth displays incisive and canine teeth in the upper jaw; but, as has been previously hinted, the fall of the milk teeth leaves the upper jaw destitute of these organs in the adult animal; their place being supplied by the development of a thick callous pad.

THE EUROPEAN BISON (*Bison Bonassus*) appears, as we have already stated, to be identical with the great fossil auroch, or *Bison priscus* of Owen. At one time it was common in Germany and the south of Sweden; but at the present day it occupies a comparatively restricted range, being found only in the forests of Lithuania, Moldavia, Wallachia, and the Caucasus. "These animals," says Mr. Broderip, "have never been domesticated, but herds of them are protected in certain localities in the forest of Bialowieza in Lithuania, under the direction of the Emperor of Russia. There are twelve herds thus kept, each herd being under the superintendence of one herdsman. The estimated number of all the herds is eight hundred. They feed on grass and brushwood, and the bark of young trees, especially the willow, poplar, ash, and birch. They do not attain their full stature till their sixth year. They are very shy, and can only be approached from the leeward, as their smell is exceedingly acute. When accidentally fallen in with, they become furious, and passionately assail the intruder. When taken young they become accustomed to their keeper; but the approach of other persons excites their anger. Two young specimens were presented to the Zoological Society of London by the Emperor of Russia. Though

it had been stated that the auroch had a natural enmity to domestic cattle, and that the young obstinately refused to be suckled by the domestic cow, the calves sent by the emperor were suckled by a cow in the Regent's Park Gardens, and very speedily became attached to their foster-mother. These creatures unfortunately died a few months after they had been brought to this country." The bisons, generally, are distinguished from oxen by their horns, which take origin in front of the so-called occipital ridge, and by the convexity of the forehead; they have also fourteen pair of ribs, being a pair in excess of the number found in the ox. The limbs of the auroch are also comparatively long; its voice has the character of a grunt, and the dusky-brown fur is curled and woolly, especially in the region of the neck, where it is profuse, forming a sort of beard under the chin and throat. By some naturalists, the Caucasian variety is thought to be a distinct species; but this is exceedingly doubtful.

THE AMERICAN BISON (*Bison Americanus*) or BUFFALO—Plate 18, fig. 59—is generally admitted to be distinct from the above, yet it must be confessed that the two species very closely resemble each other. So far as the form of the skull, the horns, the fur, and the bulk of the animal are concerned, there is little or no difference; but the limbs and tail are comparatively short, and, according to Mr. Blyth, it is provided with an additional pair of ribs. The buffalo is an inhabitant of all the temperate parts of Central and North America, and at a period not very far back, but anterior to the rise of civilization in that country, this fine animal roamed at will throughout the length and breadth of the continent—at least from the Atlantic to the Pacific, excepting the extreme northern and southern latitudes. It has never existed in South America, neither indeed has any other member of the bovine family, unless previously introduced by European colonists. At the present time they range over the wild prairies of the far west; but, like the diminishing tribes of human kind who dwell in those distant regions, it is evident that their numbers are becoming "small by degrees and beautifully less." Notwithstanding our satisfaction at seeing civilization extending to the remotest corners of the habitable globe, there is something melancholy in reflecting on the past history of these animals, associated as it is with the coeval disintegration of ancient peoples, to whom, indeed, the buffaloes have all along afforded a principal means of subsistence. These animals are still very numerous on the plains watered by the Saskatchewan River, being found as far north as Slave Point. Much has been written respecting their habits and the different modes in which they are captured by the native Indian tribes; and most of us remember the stirring and beautiful illustrations exhibited in this country by Mr. Cattlin, in whose "Letters and Notes on the North American Indians" abundant information is given about these imposing creatures. Catesby, Washington Irving, Sir John Franklin, Sir John Richardson, and others, supply most interesting particulars; but we have space only to give a few notices from the two last-mentioned authors. The latter affords us a condensed view of what has been previously written in regard

to the habits of the bison, and says that they "wander constantly from place to place, either from being disturbed by hunters or in quest of food. They are much attracted by the soft tender grass which springs up after a fire has spread over the prairie. In winter they scrape away the snow with their feet to reach the grass. The bulls and cows live in separate herds for the greatest part of the year, but at all seasons one or two old bulls generally accompany a large herd of cows. In the rutting season the males fight against each other with great fury, and at that period it is very dangerous to approach them. The bison is, however, in general, a shy animal, and takes to flight instantly on winding an enemy, which the acuteness of its sense of smell enables it to do from a great distance. They are less wary when they are assembled together in numbers, and will then often blindly follow their leaders, regardless of, or trampling down the hunters posted in their way. It is dangerous for the hunter to show himself after having wounded one, for it will pursue him, and although its gait may appear heavy and awkward, it will have no difficulty in overtaking the fleetest runner." Sir J. Richardson then proceeds to mention the case of a Mr. McDonald, who one evening went out to look for game. "It had become nearly dark when he fired at a bison-bull which was galloping over a small eminence, and as he was hastening forward to see if his shot had taken effect, the wounded beast made a rush at him. He had the presence of mind to seize the animal by the long hair on its forehead as it struck him on the side with its horn; and being a remarkably tall and powerful man, a struggle ensued, which continued until his wrist was severely sprained and his arm was rendered powerless. He then fell, and after receiving two or three blows became senseless. Shortly afterwards he was found by his companions lying bathed in blood, being gored in several places; and the bison was couched beside him, apparently waiting to renew the attack had he shown any signs of life. Mr. McDonald recovered from the immediate effects of the injuries he received, but died a few months afterwards." Of the various modes of taking the American buffalo, none display the courage and dexterity of the Indian so much as that of hunting them on horseback. "An expert hunter," says Sir John Franklin, "when well mounted, dashes at the herd, and chooses an individual which he endeavours to separate from the rest. If he succeeds, he contrives to keep him apart by the proper management of his horse, though going at full speed. Whenever he can get sufficiently near for a ball to penetrate the beast's hide he fires, and seldom fails of bringing down the animal; though of course he cannot rest the piece against the shoulder, nor take deliberate aim. On this service the hunter is often exposed to considerable danger from the fall of his horse in the numerous holes which the badgers make in these plains, and also from the rage of the buffalo, which, when closely pressed, often turns suddenly, and rushing furiously on the horse, frequently succeeds in wounding it or dismounting the rider. Whenever the animal shows this disposition, which the experienced hunter will readily perceive, he immediately pulls up his horse and goes

off in another direction." The most powerful adversary of the buffalo is the great grisly bear, whose strength is sufficient to crush the largest bull. A full-grown male will weigh as much as two thousand pounds, although an ordinary specimen comes considerably below this amount. The body is about eight and a half feet in length, from the tip of the muzzle to the root of the tail.

THE CAPE BUFFALO (*Bubalus Caffer*) is a native of South Africa, where it is known by several other names, such as the CAPE OX, the BUFFEL, and the BOKOLOKOLO, the latter title being that employed by the Bechuanas. It occurs in large herds in the plains and forests of the interior. It is an extremely heavy and powerfully built species, a full-grown specimen weighing as much as five and forty stone or upwards. The body is, in some individuals, nearly nine feet in length, exclusive of the tail, which is three feet long, terminating in a tuft of coarse black hair, reaching below the hocks. The fur exhibits a leaden-black colour. The horns are massive; very broad at the base, where they are closely approximated; and spreading from thence, horizontally, are turned upwards and inwards at the tips, which are separated from each other by an interspace of about four feet. Respecting the habits of the Cape buffalo, the early travellers, Thunberg and Sparrmann, give us some interesting data; and from their observations, and that of several later writers, these animals appear to be most formidable antagonists. Their ferocity when wounded is perfectly frightful. The herds are usually found grazing in the immediate vicinity of some large wood; in numbers varying from twenty or thirty up to at least five hundred. Their behaviour, when fired upon, seems to vary according to circumstances. Captain Harris having fallen in with a herd, thus briefly describes their conduct:—"Creeping close upon them, I killed a bull with a single ball; but the confused echo reverberating among the mountains alarming the survivors, about fifty in number, they dashed panic-stricken from their concealment, ignorant whence the sound proceeded; and everything yielding to their giant strength, I narrowly escaped being trampled under foot in their progress." Mr. Andersson's account of an encounter with these animals is very animated:—"A herd of buffaloes," he says, "at least two hundred in number, suddenly rushed past us with the violence of a tornado, breaking down and crashing everything that opposed their headlong career; and raising so great a cloud of dust as nearly to conceal their dark forms from view. I fired into the midst of them at random, and had the satisfaction to see a cow drop to the shot. The report of the rifle brought the whole herd almost immediately to a stand, and facing round, they confronted us in one dark mass. Taking advantage of a tree at some little distance ahead, I stalked to within about one hundred and fifty paces of this formidable phalanx. Resting the gun on a branch, I took a steady aim at the leading bull; but though I very distinctly heard the bullet strike him, he did not flinch in the slightest degree. One of the natives having by this time mustered courage to steal up to me with my rifle, I fired a second time, though at another of the herd,

but with no better result. Six several times at the least, did I repeat the dose; and though on each occasion the ball told loudly on the animal's body, neither it nor any one of the herd, strange as it may appear, budged an inch! They seemed to be chained to the spot by some invisible power, eying me all the while with an ominous and sinister look. Their strange and unaccountable bearing, puzzled me beyond measure. I expected every instant to see them charge down upon me. But even had this happened—though I am free to confess I felt anything but comfortable—my personal safety would not, perhaps, have been much endangered, as by ascending the tree against which I was leaning, I should have been out of harm's way. However, I was not driven to this extremity; for, whilst about to ram down another ball, the whole herd suddenly wheeled about, and with a peculiar shrieking noise, tails switching to and fro over their backs, and heads lowered almost to the ground, they made off at a furious pace." From an examination of the ground where they stood, and by information received from the bushmen, Mr. Andersson subsequently ascertained that two of the animals had been mortally wounded.

THE INDIAN BUFFALO (*Bubalus arna*) is another huge species, the body measuring ten and a half feet from the extremity of the muzzle to the root of the tail. In the wild state it is called the *Arna*; but the tame variety, so common throughout India, is termed the *Bhainsa*. The wild buffalo lives in large herds, and inhabits the marshy swamps and low grounds in the immediate neighbourhood of large forests. It is readily recognized by the uniform shortness of the tail; by the tufts of hair which protect the forehead and knees; and chiefly by the enormously developed horns, which are particularly long and directed backwards in one variety, and much curved and spread out laterally in another. Like its congeners, the *Arna* is celebrated for its ferocity. "He seems to look with disdain on every living object, and to rely on the great strength he possesses to overthrow whatever may be opposed to his rage. The smallest provocation irritates him incredibly! And such is his courage that he will sometimes even attack a group of elephants going for fodder. I do not think," says Captain Thomas Williamson, "there can be a more menacing object than a single wild buffalo disturbed from wallowing in the mud." This is a propensity to which they are very much given; and it is one which, associated with certain external characters—such as the thickness of the skin, its scanty covering of hair, &c.—serves to demonstrate a partial alliance of the buffaloes to the true pachydermatous mammalia. We cannot here, however, enlarge upon this topic. In the wild state the Indian buffalo proves a most terrible opponent, not only to the elephant, but to the tiger also. One of the principal sources of entertainment given—on anniversary celebrations and such like occasions—by the Indian families of distinction, has ever consisted in affording a display of the cruel ferocity of the tiger and buffalo. We have neither space nor inclination to describe these desperate encounters at any length; but we quote a few observations in order more particularly to show the behaviour of the animal under considera-

tion. "The buffalo, on entering the area, smells the tiger, and becomes instantly agitated with eagerness. His eyes sparkle with fury, as they quest around for the skulking enemy, which is generally attacked the instant it is distinguished. The buffalo, shaking his head and raking the ground for a few seconds with his foot, places himself in the posture of attack; and with his face brought parallel to the surface, his horns pointing forward, and his tail indicating both his determination and his vigour, rushes forward at his full speed." Such is the attitude this beast usually assumes when charging an enemy; and we can readily understand the amount of presence of mind necessary for any human being who may chance to become an object of resentment. A remarkable display of this mental discipline is recorded by Captain Williamson, in the case of a Dr. Knight, when out shooting in the neighbourhood of Daudpore. "A buffalo bull, which was at a considerable distance, after shaking his head and stamping with his fore-foot, at length fairly made at the doctor, who was fortunately provided with an excellent rifle, of a large bore. The doctor, knowing what sort of a business it was likely to prove if he awaited the buffalo's arrival, mounted a smart taniau or hill pony, which was led by his syce or groom, and made off towards a very heavy cover, and had time to conceal himself. The buffalo passed on after the doctor, who did not fail to give Punch (which was the horse's name) every provocation to exertion. His speed did not, however, equal that of his pursuer, which, though appearing to labour much, took immense strides, and was fast coming up. The doctor, finding it impossible to escape in this way, reined up suddenly, and dismounted. He had scarcely time to turn his horse's flank, and to level his rifle over the back of the saddle, before the buffalo, being within the usual distance, lowered his head and commenced the charge. The doctor, who was a remarkably good shot, fired, and happily lodged the ball between the horns of the animal; which, though killed outright, did not drop until within three or four yards of Punch's side." In conclusion, we may remark that the female *Arna*, after a gestation of ten months, produces one or two calves in the middle of summer. The tame buffalo, introduced into Italy so early as the seventh century, is a true variety of this species. As a beast of burden it possesses numerous advantages over the solidungulate horses, being able to traverse muddy swamps two or three feet in depth with comparative facility. This animal is also much valued for its strong leathery hide; but as a source of food it is much inferior to that of ordinary cattle.

THE ZEBU (*Bos Indicus*) is one of those animals with whose existence every reader of oriental history is familiar. Regarded with veneration, and even worshipped, the Zebu, or Brahmin bull, seems to lead a happy life; wandering to and fro from village to plain, grazing where it will, or receiving the votive offerings of the devout. Even its excrement is esteemed sacred; the dried dung being used for fuel in cooking food—upon which it is supposed by the natives to exert some beneficial influence—and also employed in deciphering objects on their filthy walls. The Zebu is easily recog-

nized by its convex forehead, immense chest and dewlap, and more particularly by a remarkable hump on the shoulder, which, like the analogous formation seen in the dromedary, consists entirely of fat. Some kinds are provided with short, widely separated horns, but in certain varieties these appendages are entirely wanting; in others, again, and these are the most common, the horns attain considerable development. This species varies exceedingly both in respect of size, and in the colour of the hide; generally speaking, the fur is greyish-white, and ash-coloured. The Zebu is not only found in India, but is also met with in Persia, Arabia, and even in Africa. It is in many places employed in harness to draw light vehicles, and also as an ordinary beast of burden for harder work. Its flesh, though far superior to that of the species last described, is not considered equal to that of the common ox. The hump is regarded as a delicacy; its choiceness depending apparently more on the manner in which it is served up, than upon any inherent virtue in the fatty mass itself.

THE GYALL (*Bos frontalis*), or JUNGLE OX, is about the size of a large bullock. Considerable difference of opinion has all along existed respecting its origin. By some it has been regarded as a cross breed between the Indian buffalo and certain varieties of the zebu, and by others as altogether distinct. Be this as it may, it is a well-marked form, and is distinguished more especially by the horns, which are short and thick, flattened from before backwards, and directed laterally with a slight inclination upwards. The Gyall is found in the mountainous districts of north-eastern India, and, as a domestic race, appears to thrive most satisfactorily in the province of Chittagong. According to Mr. Lambert, the bull is naturally very bold, and will defend himself against any of the beasts of prey. "The female differs little in appearance; her horns are not quite so large, and her make is somewhat more slender. She is very quiet, and is used for all the purposes of the dairy, as also for tilling the ground; and is more tractable than the buffalo." The fur exhibits a blackish-brown colour generally; whilst the length of the body, from the tip of the muzzle to the root of the tail, is upwards of nine feet. One variety of this species, termed the ASSEEL GYAALL, is regarded by some as the progenitor of the variety under consideration. It is provided with longer horns, which are strongly curved throughout, the space between the tips measuring about fourteen inches. Over the shoulders there is a considerable elevation; but it does not acquire the significance assigned to it in the humped varieties of cattle. It is not at all ferocious, even in its wildest condition. It frequents the neighbourhood of forests, cropping shoots and leaves of shrubs in preference to grass.

THE GOUR (*Bos Gaurus*) is by some considered to be a distinct species. It is a bulky animal, measuring, according to Dr. Traill, very nearly twelve feet from the tip of the muzzle to the end of the tail. The Gour inhabits certain mountainous districts of Central India, being particularly abundant on the Mysa Pat mountain in the district of Sergojah. It occurs in herds of from twenty to thirty and upwards, which, like the gyalls,

prefer to browse on leaves and tender shrubs—a marked peculiarity, which militates rather against the statement of Dr. Traill, that the habits of these two species are different, and, in our view, lessens the value of his persuasion, that these two animals are specifically distinct. However, the Gour is an important kind of ox. It is a formidable opponent in combat, and is said to be more than a match for the tiger. According to Mr. Hodgson it is with great difficulty reared in a state of confinement.

THE YAK (*Bos poëphagus*) or GRUNTING OX, is a native of Thibet, where it is found both in the tame and wild state, inhabiting "all the loftiest plateaus of high Asia between the Altai and the Himalaya, the Belur Tag, and the Peling mountains." It is a comparatively small species, and readily distinguished by its small mane on the back, and more especially by the tail, which is clothed with long hair like that of a horse. This appendage, duly prepared and sometimes dyed, is highly valued as an article of trade, and is sold to the Chinese, Turks, and other eastern nations, who employ it as an ornamental badge of distinction usually attached to their caps or turbans. Several varieties of the Yak are known, and employed for different purposes. Hofmeister, in his "Travels in Ceylon," speaks of the Yak oxen as very beautiful animals. Whilst being ridden they were shy, restless, and apparently disposed to attack their riders. "As the steepness increased," he says, "these poor animals began to moan, or rather grunt, in the most melancholy manner; and this unearthly music gradually rose to such a violent rattle, that, driven rather by its irksome sound than by the discomfort of our saddleless seat, we dismounted at the end of the first half hour." The fur of the Yak is usually black, the back and tail being sometimes quite white. Various cross breeds have been produced between this species and the common ox.

THE MUSK OX (*Ovibos moschatus*) is a native of the icy regions of North America, and is in those districts an exceedingly valuable animal, supplying the Esquimaux with one of their principal sources of food. It is readily distinguished, not only by its moderate bulk, but also by its long-haired, woolly hide (fig. 57). The ears are short, and well-nigh concealed by the fur. The horns are remarkably broad at the base, where they closely approximate, separated by a hairy interspace in the female. They are curved obliquely downwards at first, suddenly bending upwards again towards the tips. The first half of the horn is rough and light-coloured; but the remaining narrowed portion is smooth and black at the extremity. The forehead is convex, the face being prolonged forwards into a hairy muzzle. The long fur has a rich brown colour generally, but is whitish on the limbs, where it is not so fully developed. The best account of the habits of this animal is that of Sir John Richardson, who writes as follows:—"Notwithstanding the shortness of the legs of the Musk ox, it runs fast; and it climbs hills and rocks with great ease. One pursued on the banks of the Copper-mine, scaled a lofty sand cliff, having so great a dexterity that we were obliged to crawl on hands and knees to follow it. Its footmarks are very

similar to those of the carabou, but are rather longer and narrower. These oxen assemble in herds of from twenty to thirty, rut about the end of August and the

beginning of September, and bring forth one calf about the latter end of May or beginning of June. Hearne, from the circumstance of few bulls being seen, supposes

Fig 57.

The Musk Ox (*Ovibos moschatus*).

that they kill each other for the cows. If the hunters keep themselves concealed when they fire upon a herd of Musk oxen, the poor animals mistake the noise for thunder, and, forming themselves into a group, crowd nearer and nearer together as their companions fall around them; but should they discover their enemies by sight, or by their sense of smell, which is very acute, the whole herd seek for safety by instant flight. The bulls, however, are very irascible; and, particularly when wounded, will often attack the hunter, and endanger his life, unless he possesses both activity and presence of mind. The Esquimaux, who are well accustomed to the pursuit of this animal, sometimes turn its irritable disposition to good account; for an expert hunter, having provoked a bull to attack him, wheels round it more quickly than it can turn, and by repeated stabs in the belly puts an end to its life." The Musk ox is most abundant in comparatively inaccessible districts, where rocks and craggy slopes, unadorned with trees, seem to form its special home. If it could be more easily procured, the woolly fur, finer than that of the bison, would be much more extensively employed for economic purposes. According to an authority recently quoted, the carcass of the Musk ox, exclusive of the offal, weighs about three hundredweight. When well fattened, the flesh of the cow has a tolerably pleasant flavour; but that of the males or females, when lean, has a musky taste, and is both tough and highly coloured. We have said that the foot-prints of this animal can scarcely be distinguished from those of the reindeer; but according to the experience of Mr. Peterson, who accompanied Dr. Kane on his arctic travels, those of the ox are much larger, but not wider. Behind the prints there were slight

brushings of the snow, caused by hair growing from the pastern joints.

FAMILY II.—ÆGOS CERIDÆ.

Partly for convenience sake we here associate under the above title the closely allied genera represented by the sheep and goats. It is admitted that, in a purely zoological or anatomical point of view, it is difficult to impart a separate family definition to this group; nevertheless there is a *tout ensemble* about these animals which, in our opinion, justifies such a step. Even the most superficial observer cannot fail to notice a very marked difference in the general aspect of these creatures, when compared with oxen properly so called. The goats are characterized chiefly by their long horns, which are directed upwards and backwards, are more or less angular in front, rounded behind, and generally marked by transverse bars or ridges. The chin is clothed with a long beard. On the other hand, the sheep, which have no beard, have the horns directed at first backwards, and subsequently bent spirally forward. None of the members of this family exhibit the lachrymal sinuses, so characteristic of the majority of the antelopes and deer. The value of these animals to man is too well known to require lengthened comment.

THE SHEEP (*Ovis aries*).—Any attempt to enumerate or describe the principal varieties of sheep would, in a work like the present, be quite out of place. It is impossible to determine with certainty how many species of sheep exist; but there is reason to believe that all the forms may be reduced to one or two original species. Our domesticated breeds are supposed to be

derived from the Mouflon (*Ovis musimon*), which is found in Cyprus, Candia, Corsica, and Sardinia. How far this affects the question of the specific identity of such kinds as the Thibet sheep (*O. ammon*), Plate 18, fig. 60, the Argali of Central Asia (*O. argali*), and the Rocky Mountain sheep (*O. montanus*), Plate 18, fig. 61, of North America it is not easy to decide. From the earliest ages of human history the sheep has been employed in the service of man, affording him food and materials of clothing, &c. Now-a-days they supply us with meat, suet, leather, wool, tallow, and manure; the latter substance indirectly conferring many other advantages, by proving a source of fertility to various crops of grain and fodder. Among the more interesting varieties we may particularize the Fat-tailed sheep of Persia, Tartary, and China, whose caudal appendage is transformed into a globular mass of fat weighing as much as sixty or seventy pounds. Another interesting form is the *Ovis polyceratus*, inhabiting Nepaul; the male being provided with four horns. These last-mentioned organs attain an enormous development in the Rocky Mountain sheep—Plate 18, fig. 61—each of them measuring nearly three feet along their outer curvature, from base to apex. In the catalogue of ovine ruminants preserved in the British Museum upwards of thirty well-marked varieties of sheep are indicated, and this enumeration does not separately take into consideration the multitudinous sub-varieties, or domesticated breeds, which are found in the United Kingdom, and in various parts of Europe.

THE WILD GOAT (*Capra agagras*), or Paseng, is believed to be the progenitor of our domestic goats, in the same way that the Mouflon is supposed to be the original stock of our sheep. The Paseng is a native of the mountains of Persia and the Caucasus, and is distinguished by its sharp horns, which attain a very large size in the male. The varieties to which it is believed to have given origin are exceedingly numerous; the various kinds differing not only in form, size, and colour, but also in the character of their hairy covering, and in the number and disposition of their horns. The Angora variety has beautiful long silky hair; whilst the wool of the Thibetan goat supplies the natives of India with material for the fabrication of the celebrated cashmere shawls. The female, after a period of five months' gestation, usually produces two young at a birth. Though goats are chiefly valued for their skins, the milk of the female, and especially the flesh of the kids, are highly esteemed. The Rocky Mountain goat (*Capra Americana*) is possibly a mere variety of the common wild species.

THE IBEX (*Capra ibex*), Plate 19, fig. 62, is a native of the Swiss Alps, and probably of the mountainous chains of Southern Europe generally. It is provided with immense horns, which are arched backwards, and marked with prominent node-like rings throughout their entire length. The Ibex or steinboc, as it is sometimes called, is subject to great difference, those examples found in the Caucasus and in Asia being, in all likelihood, mere varieties, although they are described by some as distinct species. The Ibex is a very hardy animal, and is said to leap fearlessly down rocky precipices, falling on its massive and par-

tially elastic horns, which afford the necessary security against injury.

FAMILY III.—ANTILOPIDÆ.

By far the greater portion of the hollow-horned ruminants belong to this family, in which the osseous axis of the horns is solid, persistent, and destitute of cavities or pores. A large number of the antelopes possess lachrymal sinuses or tear-pits, in common with the deer tribe. The horns have usually a more or less conical form, cylindrical, sometimes compressed, annulated at the base, and directed obliquely backwards. These appendages are usually two in number, simple and unbranched; but in some cases there are four horns, as, for example, in the Jungliburka and Chousingha, whilst those of the Cabrit have an additional prong. This may be considered as equivalent to the brow antler of the deer, and clearly indicates an approach towards the cervine type of ruminant. Most of the antelopes are remarkable for their very graceful and slender build; the structure of their limbs being beautifully adapted for rapid flight. They are widely distributed throughout the eastern hemisphere, being more particularly abundant in Africa, where vast herds of them supply the natives with food, and too often afford the European hunter an aimless pastime—in those cases where they are shot for mere sport only. Like the generality of ruminants they are, for the most part, gregarious in their habits.

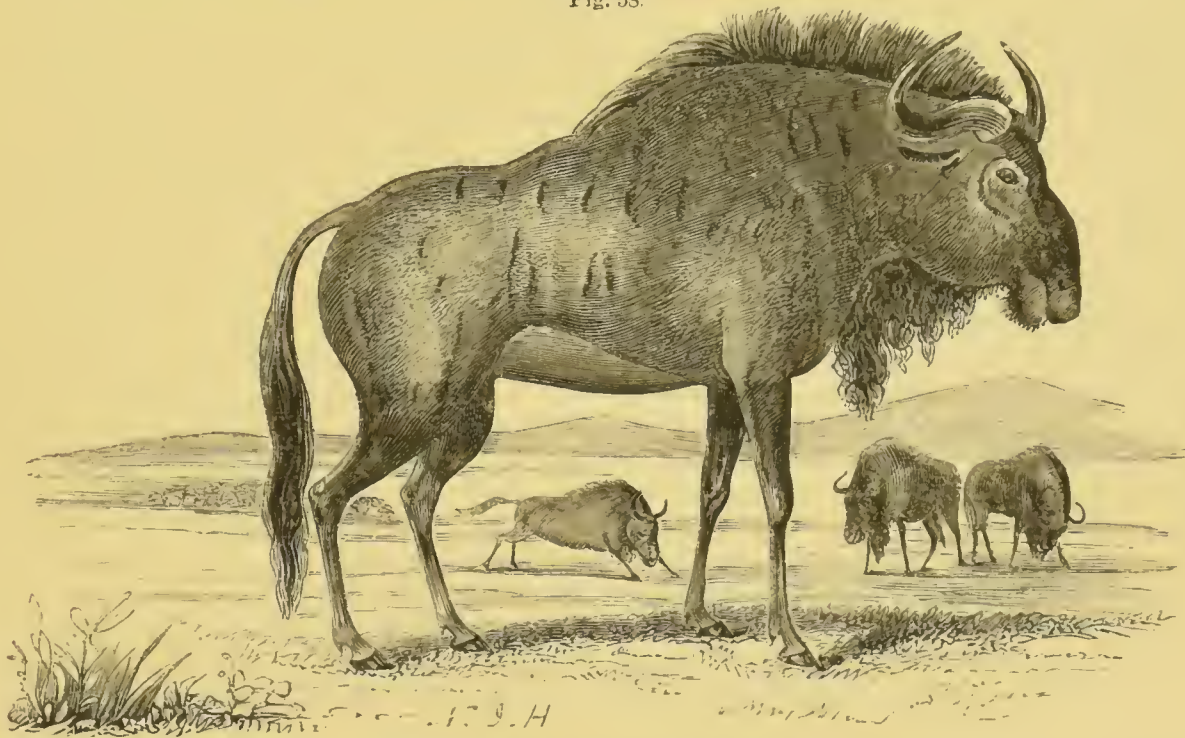
THE GNOO (*Catoblepas gnu*)—Plate 19, fig. 63—is a native of South Africa, and forms an aberrant type between the bovine and the antilopine ruminants; but its more distinctive characters undoubtedly indicate a closer alliance to the present family. The body is nine and a half feet in length, and stands about four feet six inches at the shoulder. The muzzle is large, bristly, broad, and square-shaped, the nasal apertures being operculated. The horns are broad at the base, where they expand into a broad protecting plate on the forehead; from this point they are directed downwards and slightly outwards over the eyes, and then making a regular curve upwards terminating in a sharp hooked extremity. The chin is furnished with a thick beard, similar tufts of black hair being situated below the eyes. A flowing whitish mane extends along the neck, from the occiput backwards to a point beyond the withers. The ears are comparatively small. The tail resembles that of a horse, has a white colour, and reaches to the ground. Between the fore-legs and along the central line of the thorax, the brisket is clothed with a thick shaggy development of black hair. The general colour of the fur is that of an amber-brown, passing into brownish-black. The limbs are particularly slender, terminating in bluish-black hoofs, which are pointed and compressed anteriorly. The udder of the female is provided with four mammae. The habits of the Gnoos are gregarious, and they are exceedingly wild and swift of foot, following one another in single file, and skimming the plains with extraordinary velocity; they are extremely restless, seldom remaining long at one spot, and migrating from place to place in vast herds. Captain Harris,

from whose beautiful work, entitled "Portraits of the Game and Wild Animals of Southern Africa," the annexed illustration of the brindled species is given, furnishes the following proof of their speed, and of their resemblance to a lion when seen at a great distance. "Whilst crossing the boundless plains of the Vaal river, we had an opportunity of remarking the very similar appearance of the two animals, in twice witnessing the animating but abortive pursuit of a herd of Gnoos by an enormous lion, rendered perfectly furious by the qualms of hunger, and still more desperately frantic at the disappointment entailed by the slippery heels of his intended victims, who, on both occasions, left their grim pursuer far behind, puffing and blowing, to grumble over the loss of the morning repast which he had vainly promised himself." The same eloquent writer, thorough sportsman, and competent naturalist, says—"These ungainly beasts are nevertheless shot from horseback without much difficulty, and can scarcely be pronounced formidable except in external appearance. The eyes are lowering and expressive of great ferocity; the solid casque of the horn, by which their beetling brows are overshadowed, greatly heightening their aspect of suspicion and vindictiveness. Like other animals possessing dispositions far more gentle and tractable, the Gnoo is naturally prone to charge in self-defence when wounded or forced into a corner; but, after fracturing its leg, I have repeatedly driven a reluctant individual up to the waggons, either to escape the trouble of carrying his sirloin, or because

I had expended the last bullet in my pouch. In the wild districts bordering on the colony, where a succession of level plains are traversed by low ranges of bare stony hills, prancing troops, consisting of from fifteen to thirty Gnoos of various sizes, are to be seen engaged in the most wanton frolics, and may easily be hemmed into a valley and compelled to run the gauntlet." And further on he adds:—"The curious and inquisitive disposition of the Gnoo, often induces the herd to discontinue their giddy gambols, and slowly to approach the passing caravan with an air of langhable defiance, formed in a compact square, gazing, menacing, stamping with their slender fore-feet, and at length halting within rifle range to scrutinize the bold intruders upon their lone and hereditary pastures." Such is Captain Harris' account of the whimsical character of this singular antelope, and it is fully borne out by the less animated descriptions of other travellers. The female Gnoo usually produces a solitary calf at a single birth, which at first exhibits a whitish cream-coloured fur, subsequently becoming reddish-grey. The flesh of the adult is coarse, but that of the calf is considered excellent. The tail is used for making chowries, whilst the hide is brayed and converted into riens or thongs; in this state it is chiefly employed as harness, being also applied to other economic uses as a substitute for rope or twine.

THE BRINDLED GNOO (*Catoblepas Gorgon*), KOKOON, or GORGON, is readily distinguished from the common species by its arched face, laterally directed

Fig. 58.

The Brindled Gnoo (*Catoblepas Gorgon*).

horns, deep bluish-black hide striped with obscure vertical bands, absence of any tufts of hair between the fore-legs, and immensely thick, elevated and powerful shoulders (fig. 58). The body measures nine feet in length, including the tail and head; the latter alone being twenty-three inches from the tip of the muzzle to the occipital crest. The Brindled Gnoo inhabits the interior plains of Southern Africa to the north of Orange river, its manners being similar

to those of its congeners. According to some authorities the name *Kokoon* ought to be applied to the common species; but we prefer the authority of Captain Harris, who remarks that it is thus named by the Beeluanas, while the Dutch colonists call it the *Bastaard*, and the Hottentot tribes designate it the *Baas* or *Kuop*. He gives also the following graphic description of its manners:—"When excited by the appearance of any suspicious object, or aroused by any

unusual noise, the Kokoon is wont to appear much more grim and ferocious than it actually proves; not unfrequently approaching with an air of defiance, as if resolved to do battle with the hunter, but decamping upon the very first exhibition of hostility on his part. On being pursued, the herd bring their aquiline noses low between their knees, and flourishing their streaming black tails, tear away in long regular files at a furious gallop; wheeling curiously about at the distance of two or three hundred yards, advancing boldly towards the danger, tossing their shaggy heads in a threatening manner, presently making a sudden stop, presenting an impenetrable front of horns, and staring wildly at the object of their mistrust. The slightest demonstration, however, is sufficient to put the whole squadron to flight, when they make a somewhat shorter excursion, again wheel in a circle, show a more menacing and imposing front than before, and most probably take up their position within sure rifle range. When engaged in grazing, they have an extremely dull and clumsy appearance, and at a little distance might often be mistaken for wild buffaloes; but their usual manner is sportive, at one moment standing to gaze at nothing, and at the next scampering over the plain without any apparent object in view, making various grotesque curves and plunges, with their preposterous bonassus-looking heads laid between the fore-legs." The flesh of the Kokoon resembles that of beef, and is much sought after by the natives. The hide is dressed with the mane and beard attached, and when carefully prepared is converted into useful and ornamental cloaks, shawls, and tippets.

THE NYL-GHAU (*Portax picta*)—Plate 20, fig. 67—is a native of India. It is as large as a stag, the summit of the shoulders standing more than four feet from the ground. The fur exhibits a tawny, ferruginous colour generally, being in the male of a uniform bluish-grey at the upper parts. The head is furnished with a pair of short horns, about seven inches in length, which are slightly recurved forwards; they do not exist in the female. The muzzle is remarkably attenuated; the ears are rounded, and the lachrymal sinuses rather large. The neck is broad and compressed laterally; and at the under part, near the middle line, it is furnished with a conspicuous tuft of hair. Immediately above this beard-like development there is a whitish spot; two similar patches being also seen on either cheek, below and in front of the eye. Besides these, the pasterns are marked with white spots forming more or less distinct bands round the ankle-joints. The mane is pretty strongly developed, especially over the region of the shoulders, where it forms a thickish tuft. The tail is long and bushy at the tip. According to Mr. Ogilby, the Nyl-ghau dwells principally in dense forests, "whence it occasionally makes excursions very early in the morning, or during the night, to feed upon the corn-fields of the natives which happen to be situated in the vicinity of the jungle. It is a vicious animal, of very uncertain temper, and as it is both powerful and resolute, and frequently turns upon its pursuers, it is seldom made an object of chase, except by the native princes, who employ elephants for this purpose, or inclose the game in nets." It is likewise added, that

"even in confinement, and when domesticated from birth, the violent and changeable temper of the Nyl-ghau cannot be trusted. Previous to making an attack, it drops upon the fore-knees, advancing in this position till within a proper distance; then darting suddenly forwards with the velocity of an arrow, and with a force which no ordinary animal can withstand." The female commonly produces two young at a birth, her period of gestation extending over a period of eight months.

THE BOSCH-BOC (*Tragelaphus sylvatica*) is an inhabitant of Cape Colony and Caffraria, dwelling more particularly in forests near the sea-coast. The body of a full-grown male stands two feet eight inches high at the shoulder, and measures rather more than five feet in length. The fur exhibits a bright-chestnut colour generally, being darker superiorly, but marked along the spine by a narrow white streak; white spots also exist on the cheek, as well as on the flanks and fetlocks. The forehead has a deep sienna-brown colour, and the neck is encircled by a collar-like band of a still darker hue. The horns are about a foot long, thick below, and gradually attenuated towards the rather blunt extremities; their position is erect, and they are marked by spirally directed ridges in front and behind, which disappear after traversing the first two-thirds of their length. The ears are large and rounded, the limbs stoutish, the tail of moderate extent, and the muzzle naked. There are no lachrymary openings. The females are hornless, and furnished with four mammæ. Respecting the habits of the Bosch-boe, Mr. Ogilby states that it never quits its forest haunts except during bright moonlight nights, "when it comes out to graze on the border of the forest, or to make incursions into the neighbouring gardens and corn-fields. Its voice resembles the barking of a dog, and its deceitful tone sometimes leads the benighted traveller into the most remote and lonely depths of the forest, in the vain search after some human habitation, which he is all the time leaving behind him. It is a slow runner, and easily caught when surprised; but it keeps close to the woods, through which it penetrates with great ease, running with the horns couched backwards along the sides of the neck to prevent them from impeding its course by striking against the branches, and having the neck and throat frequently denuded by rubbing against the underwood, as it forces its passage through the thick covers." The Bosch-boes are monogamous, or solitary, the male and female being usually found together, or accompanied only by one or two offspring.

THE KOODOO (*Strepsiceros Kudu*) is also an inhabitant of the wilds of Caffraria and Southern Africa, generally frequenting also the borders of streams, and not refusing to take to the water when occasion may require. It is a very large and attractive species, measuring upwards of nine feet in extreme length, and standing more than five feet high at the shoulders. The horns are massive and beautifully curved into two wide-spreading spiral circles; they are upwards of three feet in length, of a brown colour, having their tips directed outwards and upwards. The muzzle is broad, the ears large and pointed at the ends, the forehead black, the shoulders much elevated, and there are no suborbital sinuses. The fur has a buff-grey colour

generally, the limbs being reddish below the knees, the rump white, the tail, which is two feet in length and tapering, being rufous and whitish at the margins; three white spots exist on the cheek, and a pale band passes along the central line of the back, giving off, as it were, at right angles, five or six transversely-disposed whitish bands, directed downwards on either side towards the belly. These markings are not so conspicuous in the female, which is also of slighter build, destitute of horns, and furnished with four mammae. The Koodoos are gregarious, and, though still found within the colony, are comparatively scarce. They are deservedly admired by travellers who have seen them in the wild state. "Of all the varied and beauteous forms of animal life to be found in the boundless woods and plains of tropical South Africa, the Koodoo is unquestionably the most distinguished for elegance and gracefulness, united with strength." So writes Mr. Andersson, who considers it a perfect picture, and "one of the grandest-looking antelopes in the world." The same ardent sportsman gives us an account of a curious method adopted by the natives for its capture:—"The Bushmen have a way of their own of hunting the Koodoo, viz., by running it down, not by speed of foot, but by gradually exhausting it! When a hunt of this kind is decided on, a number of these people assemble, armed with assegais, &c. Having started the animal, one of the party takes up its "spoor" at a quick pace, the rest following more leisurely. On feeling fatigued the leading man drops behind his comrades, and the next in order takes up the pursuit, and so on, until they secure the prize. Sometimes this is effected in the course of a few hours; but it happens also that the chase lasts for a whole day, or even longer. All depends on the ground. If stony or rocky, the men have an immense advantage over the animal, which, under such circumstances, soon becomes foot-sore, lies down repeatedly, and after a while is found unable to rise, when it is quickly despatched. The women and children carry water on these occasions for the hunters, so that, should the animal prove very enduring, his pursuers may not be necessitated to give up the chase for want of that indispensable necessary." The flesh of the Koodoo is highly esteemed, and the hide is converted into various articles of clothing, harness, &c.

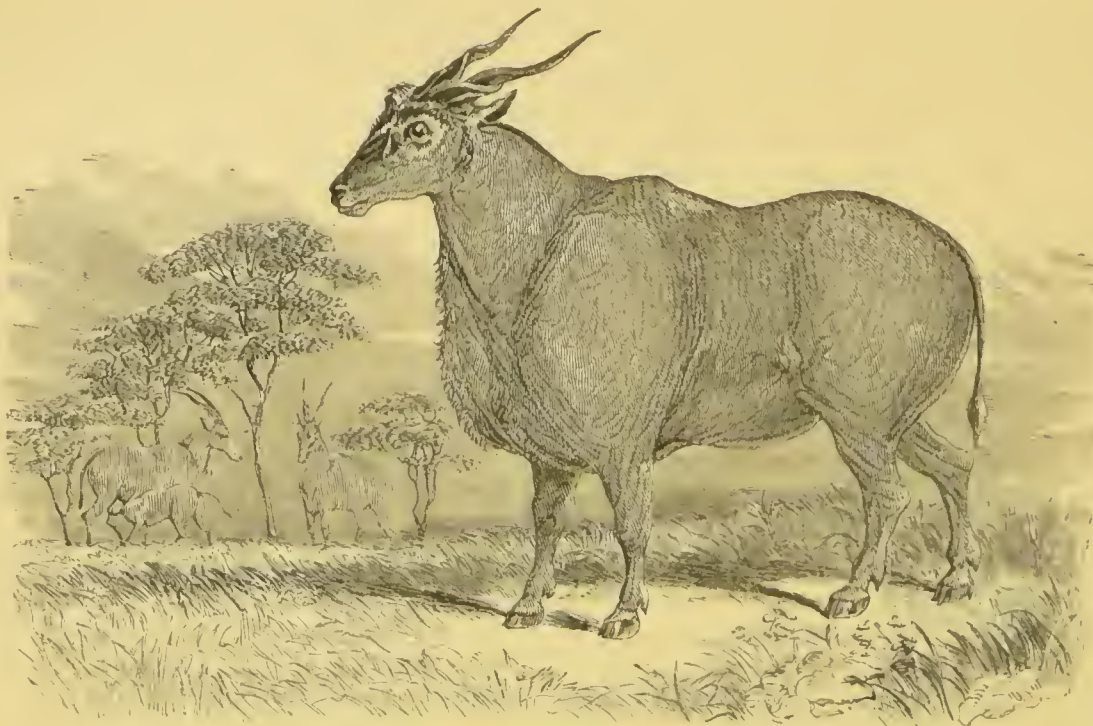
THE ELAND (*Boselaphus oreas*) is a magnificent animal, the largest of the antelopes, and on many accounts deserving of an extended notice. It is also known by the names of the Cape Elk, Ganna, and *Impoofoo*—the latter term being employed by the Bechuanas and Matabili. The importance of this ruminant will be at once appreciated when it is mentioned, that not only is its flesh of the most palatable and nutritious character, but experiments have recently established the fact that it will readily breed in this country. When it is added, moreover, that several are now thriving in the parks of English noblemen, and that a single individual weighs from fifteen hundred to two thousand pounds, it will be easily understood that the day cannot be far distant when the Eland shall become permanently domesticated in this country, and supply wholesome food, at least to the table of the wealthy. Not long ago an Eland, bred and fattened in

England, was slaughtered for the express purpose of testing its epicurean qualities, the result of which was that Royalty, both on this and the other side of the channel, partook of the venison, and pronounced it excellent. Professor Owen extolled its qualities in the columns of the *Times*, whilst many other distinguished fellows of the Zoological Society testified to the accuracy of his judgment. In short, every body pronounced a favourable opinion, in terms very similar to those of the gifted author of the "Game and Wild Animals of Southern Africa," who amusingly says:—"Both in grain and colour it resembles beef, but is far better tasted and more delicate, possessing a pure game flavour, and exhibiting the most tempting-looking layers of fat and lean; the surprising quantity of the former ingredient with which it is interlarded, exceeding that of any other game quadruped with which I am acquainted. The venison fairly melts in the mouth; and as for the brisket, that is absolutely a cut for a monarch! With what satisfaction would not King Jamie of hunting memory, have drawn his good blade adown the breast of a plump Eland, to be rewarded with five full inches of 'prime white fat on that ilk,' instead of three, as on the occasion in Greenwich Park, when Nigel assisted his sporting Majesty in the sylvan ceremony? The vast quantity of tallow yielded by the fat bulls, furnished us with constant material for manufacturing 'dips' in a candle mould with which we were provided; and during the greater part of our journey it was to the flesh of this goodly beast that we principally looked for our daily rations, both on account of its vast superiority over every other wild flesh, and from the circumstance of its being obtainable in larger quantities with comparatively less labour." Here we must pause to mention the principal characters by which this gigantic antelope is easily distinguished (fig. 59). An adult male stands fully six feet high at the shoulder, or even more; the length being in some cases upwards of nine feet from the nose to the root of the tail. The horns are nearly straight, massive, conical, furnished with a strongly-developed spiral ridge, which gradually disappears at the upper third, where the ends become attenuated and sharply pointed. In the female the horns are longer, slighter, and less markedly furrowed. The forehead of the male is clothed with a thick bundle of stiff, wiry, brownish hairs; the tuft being bordered on either side by a band of yellow-orange colour. The ears are comparatively small and the muzzle broad, the neck thick, the dewlap very prominent and fringed with long brown hairs, the legs rather short, the shoulders and hind quarters enormously developed, the fur short and of a rufous-dun or ashy-grey colour generally, the tail being about twenty-six inches long and tufted at the extremity. The female exhibits a bead-like tuft of hair on the under part of the neck, has a more ferruginous colour, and is furnished with four teats. Respecting the habits of this interesting animal, it is well known to frequent only the more open plains of the interior; "rejoicing especially," says Captain Harris, "in low belts of shaded hillocks, and in the isolated groves of *Acacia capensis*, which, like islands in the ocean, are scattered over many of the stony and gravelly plains of the interior; large herds of them are also

to be seen grazing like droves of oxen on the more verdant meadows, through which some silver rivulet winds in rainbow brightness betwixt fringes of sighing bulrushes. Fat and lethargic groups may be seen scattered up and down the gentle acclivities, some grazing on the hillside, and others lazily basking in the morning

sunbeam. Advancing, they appear to move like a regiment of cavalry in single files, the goodliest bulls leading the van; whereas, during a retreat, these it is that uniformly bring up the rear." At one time Elands were abundant in the immediate neighbourhood of Cape Town, but now very few are found within the

Fig 59.

The Eland (*Boselaphus oreas*).

borders of the colony. Considering the facilities which exist for their destruction, every effort should be made to follow up the experiments of domestication so successfully commenced by the Zoological Society, and steps should be duly taken to secure more specimens from the colony, ere they are driven far up into the interior, or altogether exterminated. Finally, we may remark that Dr. Livingstone discovered to the north of Sesheke a beautiful striped variety of Eland, distinguished by vertical streaks on the back, and by black patches on the outer side of the fore-arm.

THE HARTE-BEEST (*Acronotus Caama*), or CAAMA, is also called *Intoosel* by the Matabili. It is a large species, with a long head and much elevated shoulders. The horns are of moderate length, approximating closely at the base, diverging at first, and again converging towards the tips. The back, the nose, and the hind and fore legs are marked with dark streaks; the chin being also black. The general colour of the fur is greyish-brown, with a deep red cast. The tail is hairy and reaches down to the hocks. The Harte-beest occupies the plains of the interior of Southern Africa in immense herds, and is one of the most common species. Its flesh, though inferior to that of the eland, is nevertheless fine-grained and highly esteemed. The female is provided with two mammæ, and produces only one calf at a birth.

THE SASSABE (*Acronotus lunata*), or BASTARD HARTE-BEEST, is likewise a native of Southern Africa, occurring in small herds in the district inhabited by the Bechuanas. A full-grown example stands about

four and a half feet high at the shoulder, and is furnished with horns nearly twelve inches in length. The body is stoutish, the neck short, the limbs slender, the withers elevated, the lachrymal sinus inconspicuous, the ears being eight or nine inches long. The general colour of the fur is rufous-grey; the upper parts and legs have a deep brown tint, the forehead being marked by a dark longitudinal band. The Sassabe is naturally tame, but is much hunted by the natives. The female is comparatively small, and furnished with two mammæ.

THE BUBALE (*Alcephalus bubalus*) is widely distributed over the entire regions of Northern Africa, being especially abundant in Barbary. It is gregarious in its habits, and naturally docile in disposition. By the Arab natives it is termed the wild ox, or *Bekker-el-Wash*. It is a large species, and is readily distinguished by its remarkably compressed and straight forehead. The horns are of moderate length, lyrate, stout at the base, and strongly annulated throughout.

THE COMMON ANTELOPE (*Antelope cervicapra*), or SASIN—Plate 19, fig. 65—is a native of Persia, India, and the southern parts of Asia generally, where it dwells on rocky hills and open plains. It stands something less than three feet high at the shoulder, and is furnished with slim legs, a short tail, and a pair of large horns, which are beautifully annulated and spirally curved. The full-grown male is almost black above; the inside of the legs, under parts of the neck and belly, and the rump remaining white. The Sasin is altogether an elegant species, and remarkably swift of

foot, leaping, it is said, as much as thirteen feet in height, and clearing a space of twelve yards at a single bound! The flesh is insipid.

THE PALLAH (*Antilope melampus*), or BETJUAN, is a native of South Africa. It is a fine species, standing upwards of three feet high at the shoulders. The horns are twenty inches in length, lyrate, and coarsely annulated. The general colour is rufous, being much darker above than below, whilst the belly is quite white. The tail is about a foot long, white at the extremity, and marked by a dark-brown streak down the middle. The Pallah is gregarious in its habits; only six or eight individuals constituting a herd. The females are hornless, and provided with two teats. The flesh is coarse, but palatable.

THE MADOQUA (*Antilope Saltiana*) is a remarkably small and slim-built antelope inhabiting the mountainous districts of Abyssinia. The summit of the shoulder is only fourteen inches above the level of the ground; but it stands rather higher on the hind quarters. The horns are correspondingly thin, and about three inches in length, whilst the tail is only rudimentary, measuring scarcely more than one inch and a half from root to tip. The females are hornless.

THE GUEVI (*Cephalophus pygmaeus*)—Plate 19, fig. 64—is even smaller than the species above described, and has been variously designated the Pigmy antelope, Kleene, Blauw-boc, and Monmetzi. It is a native of South Africa, dwelling either singly or in pairs amongst dense woods and thickets near the sea-coast. The head is long and pointed, with a wide muzzle, short round ears, and diminutive horns; the latter being less

than two inches long, black, conical, and strongly annulated. The tail is about the same length, dark above and white below. The fur exhibits a dull-brownish, buff, or mouse colour, generally; being lighter underneath. The females are hornless.

THE MOHR (*Antilope Mohr*) is an inhabitant of Western Africa, and stands about two and a half feet in height at the shoulder. The horns are of moderate size, thick, and strongly annulated at the lower two-thirds of their extent, the tips being rather sharp, and bent forwards. The fur exhibits a deep brownish-red colour generally, but is white underneath and on the back part of the rump. The Mohr is highly valued by the Arabs on account of the bezoar stones or concretions found in its intestines.

THE SAIGA (*Antilope colus*), or COLUS, is an inhabitant of eastern Europe from Poland to the Caucasus, being also found in Northern Persia and Siberia. It is of moderate size, and rather bulky in appearance. It is gregarious in its habits, many thousands of them herding together, and migrating southwards during the cold season. They are much hunted and valued for the sake of their horns, which are light-coloured, semitransparent, and slightly twisted on their axis; the skins of the young are likewise highly esteemed, and employed in the manufacture of gloves.

THE CHIRU (*Antilope Hodgsoni*) is another gregarious species inhabiting the open plains of Thibet. It is a fine animal, measuring three feet in height at the shoulder, and furnished with annulated horns more than two feet in length. The fur displays a bluish-grey colour generally, overcast with a rufous tint.

Fig. 60.

The Spring-boc (*Gazelle Euchore*).

The tail measures about eight inches from root to tip. The Chiru is shy, bold, swift, and, like other species in which bezoar stones are found, is very partial to saline matters, which it licks greedily.

THE SPRING-BOC (*Gazella Euchore*) is a beautiful little creature, everywhere scattered over the plains of Southern Africa in countless herds (fig. 60). The horns are black, lyrate, provided with about

twenty prominent annulations, and curved inwards at the tip. The fur exhibits a bright rufous-dun colour, the flanks being marked on either side by a broad, rich, and deep chestnut-coloured band. The belly and insides of the legs are quite white. One of the most curious features in this species consists in the presence of several folds of integument over the rump and loins, which, when the animal is excited, are unfolded, and by the snow-white aspect of the fur at this point, present a very singular appearance. The tail is about eight inches in length, and tufted with black hairs.

THE GAZELLE (*Gazella Dorcas*) is a native of North-eastern Africa, and from its extreme elegance of form, coupled with large, full, lustrous eyes, has deservedly acquired distinction. The Gazelle or Corinne, as the female is sometimes called, stands less than two feet high at the withers, and is furnished with a pair of strongly annulated horns about ten inches in length. The ears are conspicuous and sharply pointed. The fur is more or less fawn-coloured or fulvous, but varies according to age. The habits of the Gazelle are gregarious. Considering their slender build, they are remarkably courageous, and will unite to defend themselves against the strongest Carnivora, although they usually fall victims to these overpowering enemies.

THE STEEN-BOC (*Antilope tragulus*) was formerly a very common species, inhabiting the mountainous plains and open valleys of Southern Africa; but now it is becoming comparatively rare in the colony. It stands about twenty-two inches high at the shoulder, and is furnished with round slender horns, about four inches long. The ears are large, but the tail is only rudimentary, and scarcely an inch in length. The fur has a rich rufous colour. The habits of the Steen-boc are monogamous, or solitary; the females being hornless, and provided with four mammæ.

THE GRYS-BOC (*Antilope melanotis*) pretty closely resembles the steen-boc, both as respects its solitary habits and general appearance. The horns are about three and a half inches long, the general colour of the fur being of a deep chocolate red. The ears are broad and rounded. The Grysboc is found more particularly among the wooded districts bordering the sea-coast. The females are hornless, and provided with only two mammæ.

THE DUIKER-BOC (*Antilope Grimmia*), or IMPOON of the Matabili, is also a Cape species frequenting those districts near the sea-coast, and possessed of monogamous habits. It is about two feet in height, the horns being four inches long, and marked by a longitudinal ridge in front, which traverses four or five rings at the middle. The fur is yellowish-brown; but in winter it assumes a cinereous olive tint; the forehead being clothed with a patch of long fulvous-coloured hair. The tail is short, black, and tipped with white. The female has four mammæ; her horns being very short, and concealed beneath the hair.

THE BLESS-BOC (*Antilope albifrons*), or WHITE-FACED ANTELOPE, is a native of Southern Africa, inhabiting the plains bordering on the Vaal river, and herding in immense flocks. A full-grown buck stands three feet and a half in height, and carries a pair of diverging annulated horns, measuring from

twelve to fifteen inches in length. The fur has a deep chocolate colour in front, gradually passing into a hoary bluish-white on the back and shoulders, the belly being quite white. The tail is long, reaching to the hocks. The female is similar, but of lighter build.

THE RHEE-BOC (*Antilope Capreolus*), is a gracefully formed Cape species, occurring in small herds amongst the hills and rocks in the neighbourhood of water pools and dried-up rivers. It stands about two feet four inches high, and is furnished with straight, slender, vertically-pointed horns, nine inches in length. The fur has a light rufous-grey colour, being white underneath the belly; its texture is woolly. The females have four mammæ, and are hornless.

THE REIT-BOC (*Antilope eleotragus*), or INGHALLA, possesses similar habits, and is a comparatively rare species, occurring only in the more northern parts of Cape colony, and higher up in the interior. It is larger than the foregoing, standing three feet high; the horns measure about a foot in length, and are annulated. The ears are long and pointed; the tail being also conspicuously developed. The fur exhibits a dull ash-grey colour, having a rufous tinge above, while it is lighter underneath. The females have four mammæ, are smaller than the bucks, and hornless. The reit-boc is gregarious in small families.

THE WATER-BOC (*Antilope ellipsiprinna*), or PHITOMOK of the Matabili, stands upwards of four feet at the shoulders. The horns are strongly annulated, upright, diverging, of a whitish-green colour, and upwards of thirty inches in length, the last six inches being smooth and destitute of rings. The fur has a greyish-brown tint generally; a white patch occurs on the throat, and a similar streak before each eye. The ears are full and rounded; the tail being brown and tufted, and scarcely reaching to the hocks. There are no suborbital sinuses. The females are hornless, and have two mammæ. The Phitomoks are gregarious, inhabiting the banks of the rivers of Southern Africa, especially those of the Limpopo and Mariqua.

THE GEMS-BOC (*Antilope Oryx*), or KOOKAAM, of the Matabili, is found chiefly in the Karroo, or in the open plains of Namaqualand in Southern Africa. It is a strong, bulky, and courageous species, and is armed with a pair of formidable horns, which are upwards of three feet in length, almost straight, divergent, annulated below, horizontally disposed, and tapering to a point; between them a black stripe passes down the forehead, which is crossed by a similar band above the muzzle. The ears are white, with black margins. The fur has a rusty iron-grey colour generally; it supports a mane, the hairs of which are reversed in direction; the under parts of the belly and thorax, as well as the legs, being white. The tail is bushy, black, and three feet long. The females have two mammæ, whilst their horns are even longer than those of the buck.

THE BLAUW-BOC (*Antilope leucophaea*).—Not a little confusion has arisen in regard to this species, the name here given having been applied to the little slate-coloured antelope. The Blauw-boc is, with its varieties, also known as the Bastard Gems-boc, Roan Antelope, *Etak* of the Matabili, and Takhaitze; the latter constituting a well-marked variety, known by its increased

size, large beard, and fine flowing mane. It is also distinguished for its fierceness. The Etak, properly so called, stands about five feet high at the shoulder, and is furnished with scimitar-shaped horns two feet in length; they are strongly curved backwards, and marked with about thirty conspicuous annulations. The face is black, with white streaks in front and behind the eyes; the muzzle and under parts being also white. The ears are pointed, and fourteen inches long. The fur exhibits a roan or reddish-white colour generally. The females are hornless.

THE LECHEE (*Antilope Leché*) is a large animal, inhabiting South Africa, on the banks of the river Louga. In its habits and character, it very closely resembles the Water-bœ. The horns are elongated, annulated, and curve forwards at the tip. The fur has a light brown colour generally, the limbs being much darker. In the male the mane is slightly developed; the tail being tufted and black at the extremity. Both Dr. Livingstone and Mr. Andersson have given interesting particulars of this species. The former says, "It is never found a mile from water; islets in marshes and rivers are its favourite haunts, and it is quite unknown except in the central humid basin of Africa. Having a good deal of curiosity, it presents a noble appearance as it stands gazing with head erect at the approaching stranger. When it resolves to decamp it lowers its head, and lays its horns down to a level with the withers; it then begins with a waddling trot, which ends in its galloping and springing over bushes like the pallahs. It invariably runs to the water, and crosses it by a succession of bounds, each of which appears to be from the bottom." Mr. Andersson informs us that "great numbers are annually destroyed by the Bayeye, who convert their hides into a kind of rug for sleeping on, carosses, and other articles of wearing apparel."

THE NAKONG (*Antilope Anderssonii*).—Believing this antelope to be new to science, we do not hesitate to recognize it under the above specific title. Dr. Gray thinks it may be referred to Ogilby's broad-horned antelope, but the characters, in so far as they are given by Mr. Andersson, lead us to a different conclusion. The fur displays a subdued brown colour, which is darker on the back and on the fore-part of the head and legs; having an ashy tint underneath the belly. The hair is long, and coarse in texture. The horns are black, closely resembling those of the koodoo. Its habits are similar to those of the last-described species. "By means of its peculiarly long hoofs, which are black—not unfrequently attaining a length of six to seven inches—it is able to traverse with facility the reedy bogs and quagmires with which the lake country abounds." Mr. Andersson adds that the natives frequently, at particular seasons, capture the Nakong by means of pitfalls.

THE LEUCORYX (*Antilope Leucoryx*), WHITE ANTELOPE, or ORYX—Plate 20, fig. 60—is a native of Eastern Africa. The fur has a milky-white colour generally, the throat and neck being rufous-brown; dark bands also occur on the forehead and cheeks, two of them passing vertically downwards from the inner corner of the eye. The mane is short and reversed;

the tail being lengthy and tufted at the tip. The horns are very attenuated, annulated at the lower half, and slope obliquely backwards with a very slight curvature. The Leucoryx is gregarious in its habits, and feeds freely on acacia shrubs.

THE ADDAX (*Antilope Addax*) is a native of Northern and Central Africa, and is a bulky, thick-set animal, standing upwards of three feet at the shoulder. The horns are long, narrow, spirally twisted, ringed to within five inches of the tips, sharp at the points, and measuring about thirty-six inches from base to apex. The forehead is clothed with a patch of black curly hair; the mane is well developed, the fur having a greyish-white tint generally; but the head and neck are rufous-brown. The Addax has monogamous habits.

THE CHOUSINGHA (*Antilope quadricornis*) or FOUR-HORNED ANTELOPE, is an inhabitant of the northern and well-wooded districts of India, being found especially in the districts of Bahar and Orissa. It is a comparatively small species, standing about twenty inches at the shoulders. The horns are smooth, black, conical, and sharply pointed; the posterior pair being three inches in length, while the anterior are scarcely a third of that measurement. The fur has a reddish colour generally, being whitish underneath. The females are hornless, and of a paler hue; they usually produce two young at a birth. The Chousingha is excessively wild; it is also monogamous.

THE CAMBING-OUTAN (*Antilope Sumatrensis*) is an inhabitant of the hilly forests of Sumatra, and in its habits approaches the goats and chamois. The horns are about six inches in length, slightly curved backwards, broad below, and sharp at the apex. The body is stoutish, and clothed with a long deep brown-coloured fur, approaching to black, except on the back of the head, neck, and shoulders, and inside of the ears, where it is quite white; the mane being well developed and the tail moderately long. The habits of the Cambing-outan are wild and restless.

THE CHAMOIS (*Antilope Rupicapra*) is an inhabitant of the alpine slopes of Western Europe, and, like the preceding species, is closely allied to the ægoscervine family. It is clothed with a deep-brown woolly fur, the head being of a paler colour, and banded on either side by a dark streak, which passes from the angle of the mouth to the eye and base of the ear, enveloping both. The horns are from six to eight inches long, running nearly parallel to each other, and curving backwards at the tip. The tail is short and black. The habits of the Chamois are wild and impetuous, like the torrents which it overstrides in rapid flight. It feeds on young shrubs and various alpine herbs.

THE PRONG-HORN (*Antilope furcifer*) or CABRIT, is an interesting species, as it presents a sort of transitional form between the antilopine and cervine genera; and it is for this reason that we have reserved its consideration until compelled to draw our descriptions of the members of the present family to a close. The Prong-horn is a native of the western borders of North America generally, being more particularly abundant on the borders of the Saskatchewan and Columbia rivers. It is a stoutish animal, upwards of three feet high at the shoulder, and at once recognized by its

peculiar horns, which arise from the forehead immediately above the eyes, giving off a sort of brow antler about half way up, and curving suddenly backwards and inwards at the tip (fig. 61). Below the prong the

Fig. 61.

The Prong-horn or Cabrit (*Antelope furcifer*).

horns are rough, like those of the deer; but above they are black and smooth. The fur has a fawn colour generally; being whitish on the throat, chest, belly, and rump. The Prong-horn is gregarious in its habits, frequenting open plains and hilly grounds. The flesh is coarse and unsavoury. The horns of the female are rudimentary.

According to Sir John Richardson, "the most northerly range of the Prong-horn antelope is latitude 53°, on the banks of the north branch of the Saskatchewan. Some of them remain the whole year on the south branch of that river; but they are merely summer visitors to the north branch. They come every year to the neighbourhood of Carlton House when the snow has mostly gone. Soon after their arrival the females drop their young, and they retire southwards again in the autumn as soon as the snow begins to fall. Almost every year a small herd linger on a piece of rising ground not far from Carlton House, until the snow has become too deep on the plains to permit them to travel over them. Few or none of that herd, however, survive until the spring, as they are persecuted by the wolves during the whole winter. They are found in the summer season in the fifty-third parallel of latitude, from longitude 106° to the foot of the Rocky Mountains. According to Lewis and Clark, they also abound on the plains of the Columbia, to the west of the mountains, where they form the chief game of the Shoshonees." Our authority also adds, that "the Prong-horn appears on the banks of the Saskatchewan, sometimes a solitary animal, sometimes assembled in herds of ten or twelve. Its sight and sense of smell are acute, and its speed is greater than that of any

other inhabitant of the plains, although I have been informed by Mr. Prudens, that when there is a little snow on the ground, it may with some little management be run down by a high-bred horse. The Indian hunters have no difficulty in bringing an antelope within gun-shot by various stratagems, such as lying down on their backs and kicking their heels in the air, holding up a white rag or clothing themselves in a white shirt, and showing themselves only at intervals. By these and similar manœuvres the curiosity of a herd of antelopes is so much roused, that they wheel round the object of their attention, and at length approach near enough to enable the hunter to make sure of his mark. From this disposition of the Prong-horned antelopes, they are more easily killed than any of the deer of the district which they inhabit."

Had space allowed, we should have supplied short notices of several other antelopes, including the Kob, Sing-sing, Nagor, Haar, &c.

FAMILY IV.—CAMELOPARDIDÆ.

Although represented only by a single genus, the characters of this family are sufficiently distinctive and osculant between the antilopine, cervine, and cameline species, to warrant the propriety of their being separately treated. We have already taken occasion to mention one unique structure in connection with the intestinal canal; but there are others scarcely less characteristic, being also more obvious. Firstly, we notice the horns, which are solid, persistent, and completely invested with a hairy integument. A question has been raised as to the existence of a central

or third horn. If our space permitted, we should be able to remove all doubt upon this point, having carefully compared a number of crania together, and satisfied ourselves as to the substantially correct views originally enunciated by Ruppel in "Reise in Nordlichen Afrika." Another peculiarity in the cranium arises

Fig. 62.



Front view of the Skull of the Giraffe.

out of a remarkable extension of the frontal, ethmoidal, and sphenoidal cells (fig. 62). These form a series of large intercommunicating air cavities on the top of the head, reaching from the middle of the face to the occiput. Finally, the special elongation of the tongue, the prominent orbits, the powerful ligamentum nuchæ, the long muzzle, the usual though not invariable absence of a gall-bladder, and some other minor peculiarities, satisfactorily demonstrate the legitimacy of the grounds on which the Giraffe may be considered as the representative of a distinct family.

THE GIRAFFE (*Camelopardalis Giraffa*), or CAMELOPARD—Plate 22, fig. 73—is a native of Abyssinia and the plains of Central Africa generally. It is a singularly beautiful and attractive creature, and is the tallest of all animals living on this planet—the head of a full-grown example occasionally reaching as much as eighteen feet, and the shoulders twelve feet, from the ground. The fur is short, whitish underneath, and marked throughout by angular fulvous red spots, which have a dark rusty tinge in the centre. The upper lip is extensile and undivided, the ears large, the eyes expressive, the body short, the tail being nearly three feet in length and tufted with black hair. The Giraffe is gregarious in small troops. It is naturally gentle, timid, and docile, and, as Captain Harris

observes, has no other means of protection than that afforded by the swing of the head and neck, and by the kicking of its heels, seldom employing the latter even when hemmed into a corner. The speed of Giraffes is considerable, and often secures the safety of these harmless animals; their movements during flight being characteristic and peculiar. The limbs of either side do not, as is well known, move alternately, as in the trot of a horse; but the fore and hind legs of one side are advanced almost at the same instant, so as to produce a swinging action of the body. Their tails are also partly raised and curled during flight, the tufted ends being restlessly switched to and fro. The Giraffe feeds upon mimosa twigs and blossoms. In its selection it would appear to be guided rather by sight than by taste or smell; for Professor Owen mentions that one of the fine specimens preserved in the Zoological Society's Gardens, Regent's Park, observing a lady's bonnet to present a very flowery aspect, suddenly, yet gently and politely, applied its extensile tongue to the gaudy trash, and without further ceremony consigned the tokens of her vanity to the macerating influences of its capacious paunch! In like manner the conceit of a peacock has been observed to subside under the magic touch of this lingual wand; for the bird having invaded the paddock, one of the Giraffes took occasion, when the uplifted tail had duly displayed this poor bird's pride, to gather a bunch of the bright-eyed feathers on his tongue, and swiftly raising the astonished intruder high into the air, gave him a vigorous shake, permitting him again to reach the paddock ground, from which he hastily retreated to hide his diminished tail and head!

FAMILY V.—CERVIDÆ.

The true stags and deer are at once distinguished by the presence of deciduous branching horns in the male; the females being in nearly all cases hornless. These organs vary much in character, being rounded in some species and flattened in others. They are in reality outgrowths from the cranium, and, being developed periodically, have an important physiological significance. Without detailing the anatomical and morphological changes which these singular organs annually undergo in the more typical forms, we deem it sufficient to indicate the peculiar phenomena which are contemporaneously developed during the periodical renewal of the antlers; and we do so in language we have elsewhere employed. A strong determination of blood to the head takes place at the spring of the year, and the vessels surrounding the frontal eminences enlarge. This increased vascular action results in the secretion of a fibro-cartilaginous matrix, manifesting itself externally by a budding, commencing at the summit of the core, at the spot where the horns of the previous season had separated. In the early condition the horn is soft and yielding, and it is protected only by a highly vascular periosteum and delicate integument, the cuticular portion of the latter being represented by numerous fine hairs closely arranged. From this circumstance the skin is here termed the "velvet." As development goes on, a progressive consolidation

is effected, the ossification proceeds from the centre to the circumference, and a medullary cavity is ultimately produced. While this is taking place, a corresponding change is observed at the surface. The periosteal veins acquire an enormous size, and by their presence occasion the formation of grooves on the subjacent bone. At the same time osseous tubercles of ivory hardness appear at the base of the stem; these coalesce by degrees, and inclose within their folds the great superficial vascular trunks, which are thus rendered impervious. The supply of nutriment being thus cut off, the first stage of exuviation is accomplished by the consequent shrivelling up and decay of the periosteal and integumentary envelopes. The full growth of the horns is now consummated, and the animals being aware of their strength, endeavour to complete the desquamation by rubbing them against any hard substances which may lie in their path. This action is technically termed "burnishing." After the rutting season, the horns are shed, to be again renewed in the ensuing spring; and every year they become more perfect, as represented in the accompanying woodcut, fig. 63. The letter references respectively indicate the

Fig. 63.



Development of the horns of the Red Deer.

several stages of development following upon that of the second year, in which the horn has the form of a simple unbranched stem, *a*. Like the antelopes, the stags are very swift of foot; but most of them live within, or in the immediate neighbourhood of large forests, browsing on grass, leaves, various herbs, and the shoots of young trees. Fossil remains of deer are very numerous both in tertiary and recent formations; those of the *Bramatherium* and *Sivatherium* discovered by Dr. Falkener in the Sivalik hills of Northern India, showing that in former times some members of this family attained the most gigantic proportions.

THE ELK (*Alces Malchis*), or MOOSE-DEER—Plate 21, fig. 71—is an inhabitant of the northern regions of both hemispheres. It is a large and ungainly-looking animal, standing about six feet at the shoulders, and furnished with massive palmated horns, which occasionally weigh upwards of sixty pounds, and spread out laterally over a space six feet in width. The head alone measures upwards of two feet from the tip of the muzzle to the occiput, the nose being hairy and swollen out at the upper border. The eyes are small, the ears long, the neck provided with a coarse mane, the body short and rounded, and the tail only three or four inches

in length. The fur is very coarse, rough, and wiry. Respecting the habits of the Elk, we may observe that it is naturally very timid, and when taken young is easily domesticated. Its movements look awkward as it glides along in a kind of shuffling, ambling trot, but when severely pressed it gallops with great rapidity. During the warm season it is gregarious and frequents low swampy grounds, often taking the water, through which it swims with marked facility; resorting in cold weather to sheltered forests. The flesh of the Elk is highly esteemed, and the hide extremely valuable.

THE REIN-DEER (*Tarandus Rangifer*), or CARIBOW—Plate 22, fig. 72—is a native of the most northerly districts of both hemispheres; being an animal of the utmost importance to the inhabitants of those icy regions. Space would fail us were we to enter minutely into a consideration of the various purposes to which this thoroughly domesticated species is applied; or if, on the other hand, we attempted to clear up the disputed point as to whether the North American and Lapland forms are one and the same species or entirely distinct; those who are interested in this question should consult Mr. Andrew Murray's Memoir, published in the *Edinburgh New Philosophical Journal* for 1858. The Rein-deer is furnished with cylindrical horns, and on account of the great variety of shape which the branches assume, any attempt to establish specific distinctions, merely on the characters of the antlers, must necessarily be attended with difficulty. The habits of these animals are too well known to be here described at any length. Elks undertake extensive migrations at different seasons, with the view of obtaining a constant supply of food, which consists, for the most part, of various species of lichen. The females are provided with four mammae, two of which are spurious; they also support a pair of slender horns, very closely resembling those of the male.

THE WAPITI (*Cervus Canadensis*), or GREY MOOSE, is a large North American deer, standing about four feet six inches at the shoulders. The horns are cylindrical, and weigh about thirty pounds. The fur is reddish-brown; the hair on the throat of the male being much elongated, and the rump in both sexes marked by a patch of light-coloured hairs, bordered on either side with a blackish streak. The Wapiti is a stupid creature, gregarious in its habits, and often utters a peculiar shrill cry, which, like a donkey's braying, is stated to be particularly disagreeable. Its flesh is coarse and insipid.

THE RED DEER (*Cervus Elaphus*), or COMMON STAG, is a native of the more temperate regions of Europe and Asia, and though not so abundant in this country as in former days—when the chase was the peculiar delight of English noblemen—yet it is still sufficiently cared for in the wilds of Scotland and the western isles, where the deer-stalker enjoys his healthful and exciting sport. The fur of the stag exhibits a fulvous-brown hue generally, the rump being marked by a pale patch on either side of the short, stumpy tail, which is also of a light colour; in the fawn the hide is marked with whitish spots. The period of gestation in the hind extends over eight months, the young being produced in the month of May. During the

winter both sexes collect in vast herds; but in the rutting season the stags frequently engage in the most desperate encounters, the struggle of a pair of males occasionally ending in mutual slaughter. Sometimes the antlers are inextricably fixed by the "tynes," both animals being thus left to perish, as it were, in each other's arms!

THE FALLOW DEER (*Cervus dama*) is much smaller than the stag, and is the species most commonly seen in the parks of this country. In summer the fur is fulvous and spotted with white, but in winter it becomes blackish-brown; the rump being always more or less whitish, and banded on either side by dark streaks. The tail is dark above and white underneath. The horns are palmated superiorly; the flattened expansions being bordered with short "tynes" or dentalations. The fallow deer is now scattered all over Europe, but there is reason to believe that it was originally brought from the coast of Barbary. Black and even white varieties are not uncommon.

THE AXIS (*Cervus Axis*) is a remarkably elegant and permanently spotted form of deer. It commonly goes by the name of the Spotted Stag-deer. It is an inhabitant of Northern India, but freely breeds in Europe; and in its native haunts on the borders of the Ganges it is much hunted. On such occasions it often displays considerable resistance, and when brought to bay charges the horsemen with great violence. The Axis stands about two and a half feet at the shoulders; the fur having a fawn colour generally, passing into a dark brown on the back, whilst the under parts are quite white. The females are hornless.

THE ROEBUCK (*Capreolus Dorcas*) is a native of the temperate parts of Europe, and though not so abundant in this country as formerly, is still tolerably plentiful in the wilder parts of Scotland. This species is readily known by its horns, which divide into three short branches or "tynes" (Plate 21, fig. 70). The Roebuck is monogamous in its habits; the female usually producing two fawns at a birth, her period of gestation being five months. The venison of this deer is of inferior quality.

With regard to other members of the cervine family, we can only briefly notice the following:—

THE MUNTJAK (*Cervus Muntjac*), or KIDANG. This is a very interesting species, inhabiting Hindostan, Ceylon, Java, and most of the islands of the Indian Archipelago. The distinguishing characteristics of this animal consist in the possession of two large tusk-like canines in the upper jaw, and in the columnar extension of the cranial bones, forming elongated pedestals for the support of the two-pronged horns (fig. 64). The forehead is likewise marked with three unusual foldings of the skin (fig. 65). In general appearance the Muntjak resembles the last-described species, but, whilst the body is somewhat stouter, the limbs are, on the other hand, more slender; it is also rather larger. According to Horsfield, the Muntjak "selects for its resort certain districts, to which it forms a peculiar attachment, and which it never voluntarily deserts. Many of these are known as the favourite resort of this animal for several generations. They consist of moderately elevated grounds, diversified by ridges and valleys, tending

towards the acclivities of the more considerable mountains, or approaching the confines of extensive forests."

Fig. 64.



Skull of the Muntjak.

The same authority states, that "the Kidang is impatient of confinement, and is not fitted for the same degree of domestication as the stag. It is, however,

Fig. 65.



Head of the Muntjak.

occasionally found in the inclosures of natives and Europeans, but requires a considerable range to live

comfortably; it is cleanly in its habits, and delicate in the choice of food. The flesh affords an excellent venison, which is often found on the tables of Europeans. The natives eat the males, and always present them in a conspicuous place in their feasts; but in consequence of some peculiarities in the habits of the females, they have an aversion to them as food." The Muntjaks are monogamous, and when found in small troops, the latter usually consist only of the members of a single family.

THE MUSK-DEER (*Moschus Moschiferus*) is an inhabitant of the elevated plains of Central Asia, extending as far as the eastern provinces of China. It is about the size of the roebuck, but unlike that species, stands much higher on the haunches than at the shoulder. One of the most distinguishing peculiarities, however, arises out of the presence of a pair of long canines in the upper jaw, which in the males project outwards below the chin. Another still more distinctive feature consists in the presence of a glandular pouch in the immediate vicinity of the navel. This occurs only in the male; it is about the size of a hen's egg, and contains an unctuous brown secretion, which is the musk of commerce. A single grain of this substance is sufficiently odorous to impregnate the atmosphere of an ordinary room for several years, without apparently diminishing in quantity! The fur of the Musk-deer varies much in colour; it is more or less brownish, the throat being white, with light bands on the sides of the neck; whitish grey spots also occur along the lateral parts of the body. The ears are long and narrow. The feet are furnished with largely-developed spurious hoofs. The tail is very short. Respecting the habits of this animal, Pennant states that it is naturally shy and timid. It frequents the most inaccessible rocks, and often succeeds in evading the hunter's skill.

There are several other small kinds of Musk-deer, such as the Napu (*Tragulus Javanicus*)—Plate 23, fig. 76—and the Peesoreh (*Meminna Indica*); these are not furnished with the umbilical pouch.

FAMILY VI.—CAMELIDÆ.

The Camels differ from the typical ruminants in many important particulars. They are entirely hornless; their most distinctive feature, however, consisting in the presence of incisor teeth in the upper jaw. Altogether they have thirty teeth; eight incisors, one on either side above and six below; four canines and eighteen molars, of which latter six are spurious. Another peculiarity in this family is seen in the beautiful provision of water-cells in the walls of the paunch—of which full particulars have already been given. The feet are callous underneath, partially bisulcate, and furnished with rudimentary hoofs, which only protect the upper surface of the toes. Finally, from some other minor characters, chiefly osteological, it is clearly evident that the Camels make a decided approach towards the solidungulate and pachydermatous types.

THE DROMEDARY (*Camelus Dromedarius*), or ONE-HUMPED CAMEL—Plate 23, fig. 74—has been celebrated from the earliest historic times; and though no longer known in the wild state, is still abundant in the East,

forming an indispensable companion to the traveller as he journeys over the wild sandy wastes of Egypt and Arabia. Well may the Arabs call this creature the "ship of the desert;" for a more elegant or appropriate title could not be devised. Bearing a heavy cargo of goods to the extent of six hundred or even a thousand pounds weight; supporting a storehouse of nourishment in the form of a huge bundle of fatty matter on its back; supplied internally with an unfailing reservoir of thirst-refreshing water; armed with sole-protecting foot-pads, in the form of broad elastic cushions, which extend for a considerable distance on either side of the toes; the camel, thus befittingly adapted for a toilsome journey, moves at the bidding of his guide; steers with undeviating course through the trackless paths of the sandy plains, and sustains with ease and cheerfulness the superabounding load! On rolls the blast with desolating waves of scorching sand; clouds of impalpable dust rise high into the air, obliterating all trace of the sunny sky; the suffocating wind threatens death to man and beast; the water-skins have parted with their treasure, and dried under the effects of intolerable heat. At length the storm has subsided, but the parched lips only tell too truly that all must perish! There is one resource left—at least such is the testimony of history. To save his earthly lord the burdened beast must die. The friend in need—who has pillowed his master's head, and warmed his chilled frame at night—must, at the hour of death, supply the life-restoring draught; thus imitating, as it were, the example of that nobler sacrifice which has conferred imperishable blessings upon mortal man! In some cases, indeed, a dire fatality carries off the whole company of the akkabah or caravan, such as happened in the year 1805, when no less than two thousand persons and eighteen hundred camels perished from the overwhelming fury of a terrible simoom. In regard to the characters by which the Dromedary is distinguished we need say little, as the solitary hump is sufficiently distinctive. For food the camel is contented with the poorest and driest of prickly herbs, but the amount taken is exceedingly moderate for so bulky an animal. In Europe these animals are little employed; but at Pisa, in Tuscany, a stud has been kept up ever since the middle of the seventeenth century; and there they breed freely. The hide, fur, flesh, &c., of the Dromedary are employed for various economic purposes, upon which it is needless to dwell.

THE BACTRIAN CAMEL (*Camelus Bactrianus*) is an inhabitant of Asiatic Turkey, Persia, and the elevated plains to the north of the Himalaya mountains. It is a comparatively rare species, but easily recognized by its possessing two humps on the back. The Bactrian camel is stout, thickset, and awkward-looking, and varies very much in colour, the fur being long and shaggy, especially underneath the chin and throat. A fine example is still living in the Zoological Society's Menagerie, Regent's Park.

THE LLAMA (*Auchenia glama*) or GUANACO—Plate 23, fig. 75.—Much diversity of opinion exists as to whether two or more species of this genus are known. Some, who follow Dr. J. E. Gray, believe that there are four species; but we incline to the persuasion that

this reckoning gives us at least one too many. These animals are natives of Peru and Chili, and represent, in the western hemisphere, the camels of the East. They have no humps on the back, are a much smaller species, and have a dense woolly fur, which, in the wild state, exhibits a pale chestnut-brown colour. The fur of the domesticated Llama is variously tinted. The sole-pads, instead of being broad as in the camel, are double and narrow, each division being limited to one side of the cloven foot, whilst the nails, in lieu of being weak, are powerfully developed and strongly curved. The Llamas frequent rocky places; and in consequence, therefore, of the easy separation of the toes, combined with the modifications of the pad and hoof here referred to, it becomes at once evident that such a condition of the foot is peculiarly adapted to an animal whose life is destined to be spent—unlike that of his desert-traversing congener—on the rugged slopes and precipices of the Andes. As a beast of burden,

the Llama is not capable of sustaining a load of more than two hundred pounds weight, half that amount being ordinarily considered sufficiently oppressive. Attempts have recently been made to introduce the Alpaca—the *Llama Pacos*, of some authors—into Australia, and the experiment has already been attended with sufficient success to warrant the belief that ere long they will become extremely useful and abundant in the colony. The alpaca may, after all that has been urged to the contrary, only constitute a well-marked variety of the Guanaco. Though not employed as a beast of burden, it is a much more valuable animal than the Llama, the hair of the fur being much longer, and of a soft, silky texture. Respecting the Vicugna (*Llama Vicugna*), which is by all authorities regarded as a distinct species, we have only room to remark that it possesses a fine fulvous woolly fur, which is extensively employed in manufacture by the natives of Peru.

ORDER X.—SOLIDUNGULA.

IN the arrangement of Cuvier, the solidungulate quadrupeds form the third family of the order Pachydermata; but, by general consent, it is admitted that the present group is worthy of being separately treated in the manner here proposed. In Professor Owen's system, the solidungulates constitute a subdivision of his odd-toed ungulates or Perissodactyla. The members of this order are at once characterized by the circumstance of their possessing, or rather appearing to possess, only a single toe, which is incased in a solid box-like hoof; there are, however, on either side of this large central toe, rudimentary digits, in the condition of two splint-like bones, corresponding to the second and fourth metacarpal and metatarsal bones of the human extremities. Another distinguishing feature is seen in the dentition, which is made up of forty teeth; twelve of these are incisors, equally divided above and below; four are canines, the upper being almost invariably absent in the female; the remaining twenty-four being molars, whose crowns are flat and

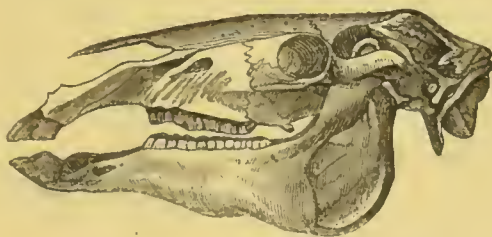
directing the horse's speed. The stomach of the solidungulates is simple and undivided; the cœcum and large intestines being extremely capacious, and the gall-bladder entirely wanting. Finally, it may be remarked that fossil solidungulate remains have been found in the tertiary deposits of various parts of the world, but it is impossible to determine how many species of the order may have roamed over the uncultivated plains of geologic time.

FAMILY—EQUIDÆ.

All the members of the order may be associated together under a single family title, as above, or they may be considered as belonging to a single genus. The family characters are the same as those of the order. All existing species were originally inhabitants of the eastern hemisphere—the mountain plains and wastes of Asia and Africa constituting their native abode. In the wild state they are gregarious; their speed is swift, and grass forms the principal element of their food.

THE HORSE (*Equus Caballus*)—Plate 24, fig. 77—is of all animals the most highly esteemed, and deservedly so. Although it does not prove such a valuable source of food as certain of the ruminants; nevertheless, in an indirect manner, it supplies us with the means of procuring sustenance from various sources, proving absolutely indispensable to the agriculturist. To enter into a history of the uses to which this matchless quadruped has been put, or to enumerate the countless varieties of breed into which it has passed, would lead us far beyond the limits assigned to our description of the present family; suffice it to say, that all the well-known domesticated forms are only varieties of an original wild stock, and that it is doubtful if this original type exists in the condition of its native progenitors. It is true that thoroughly wild breeds roam at large over the wild steppes of Asia and the spacious plains of South America; but all these are believed

Fig. 66.



Skull of the Horse.

square-shaped, and marked by four crescentic folds of enamel—those of the upper jaw having a small additional fold at the inside. If the accompanying figure be examined it will be noticed that a considerable interspace exists between the incisors and the anterior grinders (fig. 66); it is through this vacuity that the bit is introduced for the purpose of controlling and

to have returned to this state from that of a more or less complete form of domestication. Of the several characters which specifically distinguish the horse from its congeners, it is perhaps only necessary to particularize the "flowing mane and flying long-haired tail," associated with a pair of moderately developed ears, and callosities both on the fore and hind legs. In the wild state the head is larger than in the finer domesticated breeds. "The horse," says Mr. Rarey, "according to the best accounts we can gather, has been the constant servant of man for nearly four thousand years, ever rewarding him with his labour, and adding to his comfort in proportion to his skill and manner of using him; being to those who govern him by brute force, and know nothing of the beauty and delight to be gained from the cultivation of his finer nature, a fretful, vicious, and often dangerous servant; whilst to the Arab, whose horse is the pride of his life, and who governs him by the law of kindness, we find him to be quite a different animal. The manner in which he is treated from a foal, gives him an affection and attachment for his master, not known in any other country. The Arab and his children, the mare and her foal, inhabit the tent together; and although the colt and the mare's neck are often pillows for the children to roll upon, no accident ever occurs, the mare being as careful of the children as of the colt. Such is the mutual attachment between the horse and his master, that he will leave his companions at his master's call, ever glad to obey

his voice. And when the Arab falls from his horse, and is unable to rise again, he will stand by him and neigh for assistance; and if he lies down to sleep, as fatigue sometimes compels him to do in the midst of the desert, his faithful steed will watch over him, and neigh to arouse him if man or beast approaches. The Arabs frequently teach their horses secret signs or signals, which they make use of on urgent occasions to call forth their utmost exertions." These are the words of the master and author of "The Modern Art of taming wild Horses." Few men have done more to perfect the method of treating this gifted animal than has Mr. J. S. Rarey; but space compels us to desist from enlarging on a subject, to which special works are necessarily devoted.

THE QUAGGA (*Hippotigris Quagga*).—If naturalists are prepared to admit the propriety of generically separating the horse from the ass, we may respect the opinion of Colonel Hamilton Smith, who has considered the zebras worthy of similar distinction. Their characters are evidently osculant between the two above-mentioned animals; and we are not prepared to accept the opinion of those who believe that their asinine features maintain the ascendancy. The Quagga is a native of South Africa, and is especially abundant on the open plains below the Vaal river, where it herds in immense numbers. The ears and tail are decidedly equine; the neck is furnished with an erect mane, banded alternately brown and white. The upper parts of the

Fig. 67.

The Quagga (*Hippotigris Quagga*).

hide are rufous-brown; the head, neck, and shoulders being lined with dark stripes, which become fainter as they approach the middle of the back. The chest, belly, legs, and tail, except at the root, are quite white. If there be preponderance on either side, surely these

characters lean rather to the equine than the asinine group. All along naturalists have exhibited singular discrepancies of opinion in regard to this animal. It is now many years since the Zoological Society's Gardens first displayed living examples of the Quagga; but, as

Captain Harris justly remarks, the period is not remote when confusion rode rampant on the question under consideration! "Disguised in a tail borrowed from the rump of the domestic ass, the subject of the annexed portrait (fig. 67) sat for its picture to M. Buffon, and may be found in the voluminous works of that eminent author, doing duty for a *female zebra*! Even Baron Cuvier has fallen into the error of describing the Quagga to be the proprietor of an asinine tail—a mistake which is the more surprising since it is stated by the same author in his 'Règne Animal,' that 'among the equipages occasionally exhibited in the gay season in Hyde Park, and other fashionable places of resort, may be seen a curricule drawn by two couaggas, which seem as subservient to the curb and whip as any well-trained horses.'" The average height of the Quagga is about four feet and four inches at the shoulder. In its native haunts it is sociable and peaceable; but if roused by an enemy it exhibits great courage, and is said to repel the attacks of large carnivora, on some occasions at least, successfully. Its voice is not unlike the bark of a dog.

THE ZEBRA (*Hippotigris Zebra*), or WILDE PAARD of the Cape colonists—Plate 24, fig. 79—occupies the mountainous parts of Southern Africa. It is somewhat less in height than the Quagga; the mane being erect and bushy, with alternating bands of black and white. The entire body, head, and limbs are striped with

narrow black bands, the upper ones being united to the central longitudinal streak on the back. The general ground-colour of the hide is white. The hoofs are narrow, and much hollowed out at the sole. Zebras are very shy and gregarious in their habits, living in troops sometimes numbering upwards of a hundred individuals. In a domesticated state numerous hybrids have been produced by association with the horse and ass. The flesh of the zebra, though eatable, is coarse, oily, and unpalatable. According to the testimony of Mr. Andersson, the subdued neighings of the Zebra have a very melancholy character when heard at a distance; and, on one occasion, this enterprising sportsman mistook its moribund groanings for the gasping ejaculations of a drowning man. The female is furnished with two mammae.

BURCHELL'S ZEBRA (*Hippotigris Burchellii*) is an inhabitant of the plains of Southern Africa to the north of Orange river. The Cape colonists call it *Bonti Quagga*, and by the native Bechuana and Matabili it is termed the *Peechey*. It stands about four feet six inches high at the shoulder, and is a comparatively stout-built species. The mane is erect, five inches in depth, and more or less marked by alternating bands of black and white. The muzzle is black; the ears and tail being thoroughly equine in character. The head and upper parts of the body have a reddish-brown ground colour, being beautifully streaked by irregularly

Fig. 68

Burchell's Zebra (*Hippotigris Burchellii*).

sinuous, broad, black bands, which do not unite with the longitudinal dorsal line; the latter widens towards the croup. The tail, legs, and under parts of the chest and belly are quite white (fig. 68). The female is similarly marked, and is furnished with four mammae. Like its congeners, Burchell's zebra admits of being

tamed; but, under the most favourable circumstances, it is considered unsafe, obstinate, and treacherous. Respecting its habits and appearance in the wild state, none have so effectively written upon this subject as Captain Harris:—"Fierce, strong, fleet, and surpassingly beautiful, there is perhaps no quadruped in crea-

tion, not even excepting the mountain zebra, more splendidly attired, or presenting a picture of more singularly attractive beauty, than this free-born of the desert. It would be difficult to convey to the uninitiated a suitable idea of the sparkling effect produced by their vivid and strikingly-contrasted colours, when seen pawing the valley in all the pride of conscious liberty, or flying in compact columns before the equestrian foe." Warming up with the vision of a mighty herd bounding over the sandy main, our eloquent author continues:—"Anon, a dark pillar of dust rises from the plain, and undisturbed by any breath in heaven, mounts upward to the clear azure sky like a wreath of smoke—three ill-omened vultures soaring in circles above it. Nearer and more near rolls on the thickening column, until several dark living objects are shortly perceived dancing beneath it. Emerging from the obscurity, their glossy and exquisitely variegated coats, glittering in the sun's rays, *ventre au terre*, the head of a column of Burchell's zebras next appears, and instantly afterwards the serried horde sweep past in gallant array; their hoofs clattering on the hard ground like a regiment of dragoons. Tearing by at racing speed, straining neck and neck with their shaggy whimsical-looking bovine allies (*i.e.* Brindled Gnoos), their own striped and proudly curved necks seem as if they were clothed with thunder, and their snowy tails are streaming behind them. Now the troop has wheeled and halted for an instant to survey the foe. A powerful stallion advances a few paces with distended nostrils and stately gait; his mane newly hogged, and his ample tail switching his gaily checkered thighs. Hastily reconnoitring the huntsman, he snorts wildly, and instantly gallops back to his cohort. Away they scour again, neighing and tossing their striped heads aloft, switching their light mule-like tails in all the pride of fleetness and freedom. Another halt and another *reconnaissance*. Her small equine ears laid viciously down, a skittish mare has now fallen out of the ranks, and is in the act of delivering both her active heels plump into the ribs of an admirer, whose wantonness has prompted him to seize a tempting opportunity for inflicting upon her sternum an amorous bite; and now, with a neigh of exultation and a vain-

glorious toss of her coquettish head, free and unfettered as the wind, away she careers again, still waited upon by her lover, who is nothing daunted by his rebuff; and their forms are finally concealed by the cloud which follows the heels of the again retreating squadron." A gorgeous specimen of this truly beautiful species, may now be seen in the Regent's Park menagerie.

THE ASS (*Asinus vulgaris*) has been generically separated by Dr. J. E. Gray, and is readily distinguished from the various kinds of horse by its tail, which is clothed with short hair at the upper part, and only tufted at the extremity; the hind legs being likewise devoid of warty callosities. The fur has a grey colour, and exhibits a dark streak along the central line of the back, crossed by a similar band running over the shoulders. The ears are of great length; the forehead being also slightly arched. Respecting the qualities of this animal, we need say little. No unfortunate beast of burden is so much neglected on the one hand, or maltreated on the other. As to its origin, naturalists are divided in opinion; some maintaining that it is a domesticated variety of the Koulan, or wild ass of Persia (*Asinus onager*), others believing that the last-named is only the domestic animal which has returned to a wild state—the original stock having altogether disappeared. Whichever view is correct, we think there can be little doubt that the two forms are specifically identical, and consequently that they have descended from a common parent.

THE KIANG (*Asinus Hemionus*), or TSHIKITEI, is another kind of wild ass, intermediate in character between the above-described species and the horse. The ears are of moderate length, the fur is smooth, and of a bright rufous-bay tint; the legs having a pale straw colour. A dark broad streak runs along the central line of the back, but it is not crossed by any similar band over the shoulders. The Kiangs herd together in small numbers, roaming over the sandy steppes of Central Asia. The males are fine animals, standing sometimes as much as fourteen hands high at the shoulder; and, moreover, they neigh like horses. A noble specimen has been recently brought over to this country, and may be seen in the Zoological Society's Menagerie, Regent's Park.

ORDER XI.—PACHYDERMATA.

ALTHOUGH naturalists are divided in opinion as to the best mode of classifying the non-ruminating hoofed quadrupeds, all are agreed that the dissimilar groups, collectively associated by Cuvier under the title of Pachydermata, cannot fairly be regarded as zoologically equivalent to the Ruminantia. It is in this view that we have adopted a somewhat modified outline of the Cuvierian arrangement, while at the same time we are prepared to recognize the more perfected idea developed in the recent classification of the Mammalia by Professor Owen. The Pachydermata, as here retained, can scarcely be recognized as having any special characteristic common to the entire order,

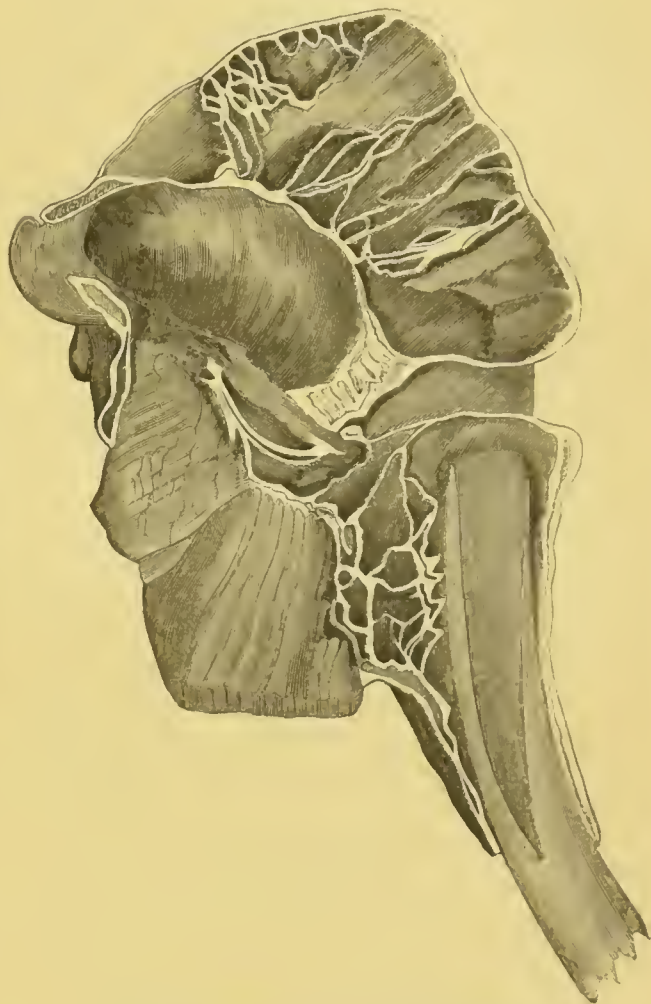
unless we are permitted to notify the more or less hardened skin, which is to a considerable extent naked or destitute of hair. In our opinion, too much stress has been laid upon this dermal peculiarity, seeing that it is shared by many other Mammalia, and is in no wise distinctive; the order has, however, derived its name from this trivial circumstance. Hitherto we have detailed the more remarkable features of the several natural groups in a general introduction to each order; but such is the variety of character presented by the several families in the present instance, that it is better to reserve these particulars for separate consideration.

FAMILY I.—ELEPHANTIDÆ.

Excluding the oceanic cetacea, the living representatives of this family are the most bulky of all existing Mammalia. In the miocene and pleistocene deposits of the tertiary epoch, the remains of extinct species are extremely abundant; some of them—such as the mastodon, Plate 32, fig. 100, and deinotherium—being generically distinct. Probably the latter genus should be regarded as the type of a separate family, seeing that the lower jaw is supplied with enormous tusks, in a manner altogether unique; their crowns being directed downwards and backwards, and the roots inserted into a prolongation of the symphysis or anterior central prominence of the inferior maxillary bone. Whatever differences may have existed in these aberrant forms, the true elephants are distinguished by the possession of a remarkable nasal appendage or proboscis, commonly called the “trunk.” This organ has a tapering cornucopial outline; it is pierced at the tip for the two nostrils, and at the centre of the upper margin is furnished with a finger-like process which, in conjunction with a thumb-like thickening of the inferior border, serves the purpose of a hand. The extraordinary prehensile powers of the trunk are familiar to every one; but when it is considered how readily the same instrument can detach a straw or uproot a tree, our conceptions of its muscular and tactile powers can scarcely be too highly exalted. Another peculiarity in the organization of these proboscidean pachyderms has reference to the bulky aspect of the head. This feature, however, is not due to any increased development of the brain, but simply to a remarkable extension of certain air sinuses in connection with the cranial bones (fig. 69). The vertical elevation of the forehead thus conferred upon the elephant, has led many to ascribe to the animal an almost super-quadrupedal intelligence; but if, in this case, their opinions are based upon phrenological considerations, it is our duty to inform such enthusiasts that the frontal prominence and elevation of the cranial vertex bear no relation whatever to the bulk of the brain contained within the comparatively restricted cerebral cavity. That elephants possess considerable sagacity, no one will venture to deny; but that they display this mental quality in virtue of any corresponding enlargement of the great nervous centre, is utterly inadmissible. Another interesting peculiarity in this family consists in the form and arrangement of the teeth. Ordinarily, it is stated that the dentition comprises two incisors, no canines, and three molars; but in reality the grinders are more numerous, no less than seven being consecutively developed on each side of either jaw. This apparent discrepancy results from the circumstance, that only two molars are present on one side of either jaw at the same time; but, in the progress of growth and age, those first employed give way to a succession of similar teeth developed from behind. In like manner the two large permanent incisors are preceded by a similar pair, which, however, have never attained full development. Histologically speaking, the tusks consist entirely of dentine, which, on transverse section,

exhibits an elegant series of decussating curvilinear striæ. This appearance is peculiar to the ivory of elephants, and considerably enhances its commercial value. In a structural point of view, the molars are

Fig. 69.



Vertical Section of the Skull of the Elephant.

still more remarkable. If reference be made to Plate 32, fig. 102, it will be observed that the grinding surface is marked by a number of parallel bars. These consist of alternating plates of the three different substances which ordinarily enter into the composition of the mammalian tooth; the white bands representing plates of *enamel*, each inclosing a central lamina of ivory or *dentine*, whilst the several outer spaces between these formations are filled up with a special osseous development termed *cement*. In the African elephant the enamelled plates have a lozenge-shaped outline, as seen in Plate 32, fig. 101; in the Siberian mammoth, or *Elephas primigenius*, they are more numerous and closely approximated; and in the mastodon are elevated into a series of tuberculated cones. In regard to the skeleton, we may remark the general massiveness of all the bony elements, the twenty pairs of ribs reaching backwards almost to the pelvis, the remarkable breadth of the scapula in proportion to its length, the prodigious development of the external condyle of the humerus, the simple form of the femur, the peculiar articulation of the superior extremity of the radius, and the odd-toed, pentadactylous feet. The digestive organs are extremely bulky as in herbivorous quadrupeds generally. The gall-bladder is complicated by numerous internal septa, and intimately connected with the walls

of the intestine. The mammæ are two in number, situated beneath the anterior part of the chest. Elephants herd together in considerable numbers, subsisting entirely on vegetable matters.

THE INDIAN ELEPHANT (*Elephas Indicus*)—see Frontispiece—is a native of the peninsula from whence it derives its specific name; and also of Ceylon, Sumatra, and Borneo. From the earliest times it has been employed as a beast of burden; and in European menageries it has ever formed one of the most attractive objects of amusement to natural history loving people. It is distinguished from the African species by its oblong head, which is concave anteriorly; by the character of the enameled ridges on the crown of the molar teeth already described; by the comparative smallness of the ears; by the very short tusks of the female; by the paler colour of the hide; and by the circumstance of its having four nails on the hinder feet. It is not our intention to dwell at any length upon the habits of the elephant in a tame or semi-domesticated state, otherwise we should be led to record numerous anecdotes in which the sagacity of this animal has been very unduly exaggerated and embellished with erroneous statements. The following particulars, however, will be found interesting:—"Elephants," says Captain Williamson, "have a great dislike to camels, though they will travel with them, when laden, without showing it much. Nothing distresses this majestic animal more than being closely followed by a horse, especially at a canter or other quick pace. Probably the clattering of his hoofs creates alarm. An elephant cannot bear the approach of dogs, or other small quadrupeds; and if, in proceeding through a grass jungle, game should start near him, he will frequently evince great uneasiness. In heavy covers elephants are of infinite service, their bulk, and the noise occasioned by their movements, often rousing game which would else remain secreted, and their height giving a commanding view to their riders." Elephants have likewise a particular hatred of the rhinoceros, and can scarcely be induced to approach within sight or smell, even though the animal be dead. Their disposition is extremely capricious in the tame state, and their mode of resenting real or fancied insults is often attended with terrible destruction to life and property. Instances of this are too well known to need illustration. For the capturing of elephants in the wild state, various methods are adopted in different parts of India. The most usual mode is by driving them into a *keddah*, or large inclosure surrounded by a deep trench and external paling, strongly built, and propped from without by large wooden beams. Several thousand natives are employed in frightening and driving them into this decoy; but the operation is usually attended with much difficulty. When once secured within the area, their subsequent submission and domestication is only a work of time. Another mode of taking them is by means of *koomkies* or decoy elephants; these are females taught to simulate wanton wiles; and being conducted by their drivers to the *saun*, or isolated male, which they propose to take, the unsuspecting beast is secured by the mahouts whilst engaged in the all-

absorbing pleasures of courtship and fancied secrecy. Ropes being passed round his legs, and the hind pair having been fastened to a tree, the drivers now steal from beneath his body, and the koomkies leave the beast to his fate. On detecting the snare, he becomes perfectly furious, destroying whatever may be in his way, "tearing up the tufts of grass by the roots, rending from the tree such branches as may be within his reach, and eventually straining to throw down the tree itself by his weight, or to pull it up with his trunk. In short, his whole powers are in action on this occasion; and it is not until being completely overcome with fatigue, and nearly dead from his natural thirst, which is greatly augmented by constant roarings, that he subsides into a sort of tranquillity." In a day or two he takes food from the *mahouts* who constantly visit him; and at length he permits himself to be conducted to the home of the successful proprietor. A third mode of capturing the elephant is by means of the *phaun* or slip knot. This consists of a stout rope, ten or twelve yards long, and at least an inch in thickness, with a sliding noose at the free extremity. A single small-sized elephant being selected out of a herd, a skilful mahout, mounted on a tame elephant, gives chase; and throwing the loop over the animal's head, he soon moderates or checks its progress by tightening the cord. The breathing becoming straightened, the driver is not long in acquiring entire control over his captive, which is ultimately conducted to a place of security. A fourth plan consists in digging pits; but this method is highly objectionable, as the animal sometimes sustains irremediable injury. Before concluding we may remark that the Indian elephant rarely exceeds nine feet in height; the average stature being about eight feet at the shoulder. The tallest specimen ever known in Bengal measured, it is said, nearly twelve feet, and was proportionately bulky. Mr. John Corse, however, who kept a large establishment for the rearing of elephants at Tipperah, has stated, in a memoir communicated to the Royal Society in 1799, that the largest species he ever heard of did not exceed ten feet six inches. The same authority states that the period of gestation in the female, extends over a space of twenty-two months; only one young being produced at each birth.

THE AFRICAN ELEPHANT (*Elephas Africanus*) occupies an extensive range in the interior plains and forests of the continent from whence it derives its specific title. As already hinted, it is at once distinguished from the Asiatic species by the remarkable size and expanse of the ears, by the presence of well-developed tusks in the female, by the darker aspect of the skin, by the lozenge-shaped ridges of enamel on the crowns of the molar teeth, and by the presence of only three nails on the hinder feet. The male attains a height of twelve feet at the shoulder, and is on an average taller than its Indian congener; its tusks are much larger, measuring between eight and nine feet in length, and weighing upwards of a hundred pounds, those of the female being four feet long. The weight of ivory of various kinds annually brought over to this country is said to amount to four hundred and sixty-eight tons, which is equivalent to a sum of about £300,000 sterling;

and as it also appears that at least fifty-two thousand elephants' tusks are imported, it necessarily follows that twenty-six thousand of these gigantic animals are yearly put to death to satisfy our demand for its valuable incisor teeth! If the present species, therefore, did not occupy an extensive area of distribution, a very few years would, at this ratio of destruction, suffice to render it altogether extinct. The improvements in fire-arms have rendered the slaughter of this beast a matter of comparative ease; and looking back on the page of history, it is not a little curious to observe the ridicule cast upon the statements of those who first, single-handed, undertook hunting expeditions into the interior of Africa. We even find the distinguished author of the "Oriental Field Sports" severely questioning the veracity of Monsieur Vaillant, who, at the close of the last century, published an account of his sporting successes in the plains of the great African continent. "No native of Bengal, nor any European resident *there*," says Captain Williamson, "would undertake such a piece of rashness as to go out shooting wild elephants!" Time, however, silently works progress, and our libraries now teem with records of daring adventure with this most formidable proboscidean pachyderm. Dr. Livingstone has borne testimony to the substantial accuracy of Mr. Gordon Cumming's writings, and we are not aware that any one has thought it necessary to doubt the no less remarkable statements and experiences of Mr. Charles John Andersson. Some of Mr. Cumming's exploits appear to have been accompanied with unnecessary cruelty, which is the more to be regretted, as, under ordinary circumstances, the manifest sufferings of these huge mammals in the agonies of death should be sufficient to excite sympathy, and induce the sportsman to deprive them of life in the swiftest manner possible. The behaviour of the young when deprived of a parent is particularly worthy of remark. Thus, Captain Harris having shot a female elephant whilst hunting in Cashan mountains, was much struck with the subsequent conduct of its helpless calf. It was about three and a half feet high, and emerged from a bush, uttering mournful notes. "We had observed the unhappy little wretch," he says, "hovering about its mother after she fell, and having probably been unable to overtake the herd, it had passed a dreary night in the wood. Entwining its little proboscis about our legs, the sagacious creature, after demonstrating its delight at our arrival by a thousand ungainly antics, accompanied the party to the body of its dam, which, swollen to an enormous size, was surrounded by an inquest of vultures. Seated in gaunt array, with their shoulders shrugged, these loathsome fowls were awaiting its decomposition with forced resignation; the tough hide having defied all the efforts of their beaks, with which the eyes and softer parts had been vigorously assailed. The conduct of the quaint little calf now became quite affecting, and elicited the sympathy of every one. It ran round its mother's corpse with touching demonstrations of grief, piping sorrowfully, and vainly attempting to raise her with its tiny trunk. I confess I had felt compunctions in committing the murder the day before, and now half resolved never to assist in another; for, in addition to

the moving behaviour of the young elephant, I had been unable to divest myself of the idea that I was firing at my old favourite, *Mowla-Buksh*, from whose gallant back I had vanquished so many of my feline foes in Guzerat." The captain, nevertheless, recovered himself sufficiently to assist in hewing out the tusks, an operation of no small difficulty even in the female. The elephant calf was next conducted to the waggons, but perished in the course of a few days, as did two others much older, which they afterwards captured. This also leads us to remark, that, notwithstanding the anxiety which naturalists have displayed in regard to the importation of a living African elephant, and the care with which they have conducted the preliminary operations, all their efforts have as yet failed to prove successful. In a very recent attempt, the young proboscidean perished before it had left the shores of its native country. With regard to the experiences of other African adventurers, some of them possess a thrilling interest, and to those whose conceptions of the delights of hunting rise in proportion to the narrowness of escapes encountered, we particularly commend the following most extraordinary adventure:—On a magnificent tropical moonlight night, Mr. Andersson, alone, as usual, took up his position on a narrow neck of land between two pools of water. He was protected by a small *skärm*, built of stones, and had with him two or three guns and a blanket. Presently a noise like the passage of a train of artillery broke upon his ear, and an immense elephant appeared, followed by others, to the number of eighteen. "Their towering forms told me at a glance," says Mr. Andersson, "that they were all males. It was a splendid sight to behold so many huge creatures approaching with a free, sweeping, unsuspecting, and stately step. The somewhat elevated ground whence they emerged, and which gradually sloped towards the water, together with the misty night air, gave an increased appearance of bulk and mightiness to their naturally giant structures. Crouching down as low as possible in the *skärm*, I waited, with beating heart and ready rifle, the approach of the leading male, who, unconscious of peril, was making straight for my hiding-place. The position of his body, however, was unfavourable for a shot; and, knowing from experience that I had little chance of obtaining more than a single good one, I waited for an opportunity to fire at his shoulder, which is preferable to any other part when shooting at night. But this chance, unfortunately, was not afforded till his enormous bulk towered above my head. The consequence was, that while in the act of raising the muzzle of my rifle over the *skärm*, my body caught his eye, and, before I could place the piece to my shoulder, he swung himself round, and with trunk elevated and ears spread, desperately charged me. It was now too late to think of flight, much less of slaying the savage beast. My own life was in imminent jeopardy; and seeing that if I remained partially erect he would inevitably seize me with his proboscis, I threw myself on my back with some violence, in which position, and without shouldering the rifle, I fired upwards at random towards his chest, uttering, at the same time, the most piercing shouts and cries. The change of position in all human

probability saved my life, for, at the same instant, the trunk of the enraged animal descended precisely on the spot where I had been previously couched, sweeping away the stones, many of large size, that formed the fore part of my skärm, like so many pebbles. In another moment his broad fore-feet passed directly over my face. I now expected nothing short of being crushed to death; but imagine my relief when, instead of renewing the charge he swerved to the left, and moved off with considerable rapidity—most happily without my having received other injuries than a few bruises, occasioned by the falling of the stones." Notwithstanding all this, Mr. Andersson snatched up another rifle, and, taking aim, pulled the trigger, when the piece missed fire; had this happened in the first instance, nothing could have prevented his immediate destruction!

FAMILY II.—RHINOCERIDÆ.

The Rhinoceroses are at once recognized, not only by their peculiar solitary or double horns, but also by their thick, scabrous, tuberculated skin, which, falling into distinct folds over various regions of the body, resembles an artificial defensive armature. The horns are strictly integumentary, being composed, as it were, of numerous bristles firmly bound and incorporated together. The head is much elongated; the jaws supporting, in young individuals, thirty-six teeth, that is, eight incisors and twenty-eight molars. Of the latter, those in the upper division have subquadrate crowns, surmounted by two transverse ridges; whilst the crowns of the lower series are narrower, more elongated, and marked by curved lines, whose concavity is turned inwards. The superior incisors are much compressed, and directed obliquely forwards; those of the lower jaw being large and pointed. The outer incisors above, and the two inner below, are very small and concealed. Among the principal skeletal peculiarities, we may mention the remarkably thick, rough, elevated, and arched nasal bones, the general massiveness of all the osseous elements, the presence of nineteen pairs of ribs, the complete development of the ulna and fibula, the forked spine of the pelvis, and the existence of only three series of digital phalanges. The digestive canal is about eight times as long as the entire body. Rhinoceroses feed upon coarse herbage, and are natives of the warmer regions of the Eastern hemisphere.

THE INDIAN RHINOCEROS (*Rhinoceros Indicus*) is the species best known—Plate 25, fig. 80—and was formerly termed *R. unicornis*, in contradistinction to *R. bicornis*; but, as Van der Hoeven has very justly remarked, these terms ought no longer to be retained, because we are now acquainted with six or seven distinct species, two of them being furnished with a single horn each, and the others with two horns. The species under consideration enjoys a pretty extensive range in Eastern India, Siam, and Cochin China, being especially abundant on the borders of the Ganges. It is chiefly found in dense jungles and shady forests, far from the haunts of man. It is remarkably savage, and attacks elephants without the slightest compunction; and

seems to take a wanton delight in destroying every living creature that comes within its reach. This animal has a singular habit of dunging in one spot; and these high dung-heaps, while they serve the purpose of indicating to other animals that danger is nigh, also afford to the native sportsman a means of guiding him as to the best spot for erecting platforms from which he secures his victim. The skin of the Indian Rhinoceros, when dried, will take a high polish, and as it is more or less capable of resisting the force of a leaden bullet, fetches a high price; the fat is also much used by the native doctors as an unguent.

THE JAVANESE RHINOCEROS (*Rhinoceros sondaicus*) also possesses only a single horn. It is distinguished from the preceding, however, by the comparatively slender head, by the proportionally elevated legs, by the character of the dermal armour, consisting of numerous polygonal scutes, whose centres are depressed and give origin to short bristly hairs, the ears being also bordered by long, stiff, and closely-set bristles. The tail is hairy underneath. By the Javanese this animal is also called the *Warak*, and it is sometimes described as *Rhinoceros Javanus*, a title given to it by F. Cuvier; the one here adopted being that employed by Baron Cuvier and Dr. Horsfield. According to the latter, the Warak is gregarious in its habits, and forms deeply excavated retreats along the declivities of mountains and hills. It does not appear to possess the ferocious character of its Indian congener; but at night-time it frequently causes serious damage to coffee and pepper plantations.

THE SUMATRAN RHINOCEROS (*Rhinoceros Sumatrensis*) possesses two horns, and was formerly confounded with one or other of the African species. The posterior horn is very short, conical, and placed a little before the eyes. The hide is rough and slightly provided with hairs; the foldings of the skin being quite inconspicuous. It is shy in disposition, and is seldom seen near the haunts of men.

BRUCE'S RHINOCEROS (*Rhinoceros Africanus*) is the form most commonly known in Africa, and is more frequently described under the vague titles of the African and the Two-horned Rhinoceros. It is the *Gargatan*, or *Rhinaster* of the Cape Colonists, the *Chukuroo* of the Matabili, and the *Borele* of the Bechuanas. Neither of the horns are of very great length, the posterior one being comparatively short; both have a greenish-brown tint. The hide exhibits a yellowish-brown colour, being fleshy underneath, and not furnished with folds. The tail is about two feet long, and bristly at the tip. The habits of Bruce's Rhinoceros closely resemble those of the Indian species. It is remarkably savage and dangerous to approach when wounded. Mr. Andersson mentions an instance where some Namaquas had shot one of these animals as it was rising from its sleep. One of the party, imagining it to be dead, approached, mounted, and stabbed the carcase. "The beast, however, had only been stunned; and as soon as he felt the cold steel enter his body, he started to his feet and made off at full speed. This action was so instantaneous as to prevent the man from dismounting, whilst the other Namaquas were paralyzed with fear. Fortunately,

however, after the beast had run forty or fifty paces, he suddenly stopped short, and looked round. The favourable opportunity was not lost; for one of the party, more courageous than the rest, instantly fired, and, as good luck would have it, brought the animal to the ground with his terror-stricken rider clinging to

Fig. 70.

Burchell's Rhinoceros (*Rhinoceros simus*).

his back." The same distinguished traveller remarks, that when the Rhinoceros is shot, it usually falls forward on the knees, and not on its sides—a result which seems explicable from the great breadth of the body combined with shortness of the limbs. The Gargatan feeds on the shoots, roots, and young branches of the wait-a-bit thorn.

SLOAN'S RHINOCEROS (*Rhinoceros Keitloa*) is better known as the Keitloa, and easily distinguished by its horns, which are nearly of equal length; the anterior horn being cylindrical, and curved backwards near the tip; the other compressed and almost straight throughout. The hide exhibits a brownish-yellow colour, pretty closely resembling the above; but there is a black mark on the inside of the thigh. Both these species are commonly termed "black," in contradistinction to the two succeeding white species. The Keitloa is an extremely morose, sulky, and savage beast, and when wounded becomes perfectly maddened with rage. Mr. Andersson nearly lost his life by the repeated attacks of a female, whose leg he had broken by a shot. One of her horns ripped up his right thigh from near the knee to the hip; and having sustained at the same time severe bruises and internal injury, his ultimate recovery was only effected after prolonged and painful suffering. The Keitloa is very swift of foot. Notwithstanding their apparent ungainliness, all the rhinoceroses possess the power of rapid progression to a greater or less extent.

BURCHELL'S RHINOCEROS (*Rhinoceros simus*) is known as the White Rhinoceros, or the *Witte Rhin-*
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aster of the Cape Colonists; being also termed the *Chicore* by the Matabili and *Monooohoo* by the Bechuanas (fig. 70). It is distinguished from the foregoing, not merely by the pale whitish-brown colour of the hide, but more particularly by the remarkable elongation of the head, which measuring about four feet from the muzzle to the ears, nearly equals one-third of the entire length of the body! It is also further characterized by a much greater bulk and size, as compared with the above; the nose being likewise square-shaped. The full-grown anterior horn is three feet in length, sharp at the point, and curved backwards. The disposition of this species is comparatively mild; and, unlike that of its black congeners, its food consists entirely of grasses.

OSWELL'S RHINOCEROS (*Rhinoceros Oswellii*) was, in the first instance, scientifically indicated as a distinct species by Dr. J. E. Gray of the British Museum. By the Bechuanas it is termed the *Kobaaba*. In point of size and general appearance, this animal closely resembles the foregoing; but, observes Mr. Andersson, "it is with regard to their horns that the two species chiefly differ from each other; for whilst the anterior horn of the monooohoo has an average length of two or three feet, curving backward, that of the Kobaaba not unfrequently exceeds four feet, and is slightly pointed forward, inclining from the snout at an angle of forty-five degrees. This rhinoceros is also the rarer of the two, and is only found in the more interior parts of South Africa." The posterior horn is about a foot long, short, conical, broad at the base, and narrow at the

tip; the extremity of the anterior horn being sharp, and worn away in front by friction on the ground.

FAMILY III.—HIPPOPOTAMIDÆ.

The Hippopotamuses formerly occupied an extensive area of distribution, as may be gathered from the numerous fossil remains occurring in the tertiary beds of Great Britain and Europe. At least five or six distinct species have been indicated. Taking our living African example as a type of the family, its principal distinguishing characteristics may be described as follows. The body is clothed with an almost naked skin; the abdomen nearly reaching to the ground. The head is broad and flat, and furnished with thirty-eight or forty teeth; there being eight incisors, four canines, and from twenty-four to twenty-eight molars, according to the age of the animal. The inferior incisors project horizontally forwards, the central pair being the longer. The worn crowns of the large canines are perfectly smooth and opposed vertically. The posterior molars are large and complicated. The ears are remarkably short; the head terminating anteriorly in a broad, abrupt muzzle, whilst the nostrils are much elevated. The feet are tetradactylous, the digits being armed with small hoofs. The tail is short. Hippopotamuses are heavy, awkward-looking animals on land; but they display a singular agility and gracefulness of motion in water. Aquatic plants, and especially grasses, constitute the bulk of their food.

THE HIPPOPOTAMUS (*Hippopotamus amphibius*)—Plate 25, fig. 81—is an animal which has always been regarded with considerable interest, although its uses to man are not of the highest order. It is familiarly known as the River-horse; and is the *Barnick* of the Nubians, the Sea-cow or *Zee-Koe* of the Cape Colonists, and the *Imfooboo* of the Caffres and Matabili; it is probably also the Behemoth of sacred history. A full-grown male Hippopotamus sometimes attains a length of nearly twelve feet, whilst the girth of its body measures scarcely less. The hide exhibits an inky-brown colour generally, being at the same time more or less tinged with a fleshy redness about the mouth and inferior parts. The latter tint is very marked in young individuals. The habits of this extraordinary creature have been studied from the earliest times, and almost every African traveller of modern date has contributed something to our knowledge of its powers. Burchell, Burekhardt, Harris, Smith, Cumming, Livingstone, Andersson and others, have witnessed its sportive wiles in the reedy streams of its native land; whilst at home naturalists have been amply rewarded by watching the behaviour of the two fine examples preserved in the Zoological Society's Gardens, Regent's Park. The Parisians enjoy a similar advantage at the Jardin des Plantes of the French capital, and they have even witnessed the birth of two young; but on both occasions the jealous mother sacrificed her much admired offspring! The first was born in May 1858, and its death resulted, perhaps, rather from accident than intention; for, we are informed, that after swimming about a while it attempted to get on dry ground; but the descent from the sleeping apart-

ment into the bath not being sloped, it experienced some difficulty in raising itself from the water; and whilst the mother was engaged in assisting it to clamber up the steps, she bruised and otherwise injured the body to such an extent that the poor little creature died the same evening. The second juvenile behemoth perished from injuries inflicted by the mother some days after its birth. In the hope of rearing a young Hippopotamus in England, the Zoological Society has spared neither pains nor expense to render the pair in their menagerie comfortable in each other's society. It is satisfactory to observe that the favoured couple live amicably together; but whether it be owing to the chilling influences of our changeable climate, or to prudential motives resulting from hippopotamine reasonings, or to other circumstances which invalidate the procreative function—we believe we are correct in stating that no reciprocations of affection have yet appeared sufficiently demonstrative to afford a belief that the authorities in question are at present likely to be rewarded for their trouble. In the wild state these animals display extreme solicitude for their young, which they carry on their necks while in the water; and, as the calves cannot remain long submerged, the mother rises more frequently to the surface when her offspring is with her. Whilst tending her young the female cannot be carelessly approached, and she will vigorously defend her offspring. All who have read Dr. Livingstone's "Travels" will remember the partial capsize and wetting he and his Makololo companions sustained from the infuriated rush of a female Hippopotamus, "whose young one had been speared the day before." Mr. Andersson and Captain Owen record similar catastrophes. The former says—"An immense Hippopotamus, with its calf, rushed out from amongst the reeds where she had been concealed, and, passing under our raft, almost immediately afterwards made her appearance on the surface of the water. Upon seeing this, I lost no time in firing; but, though to all appearance mortally wounded, we lost sight of her at the time. A few minutes afterwards, however, on coming to a bend of the river, we fell in with the canoe that had been sent on bottom upwards; and found, to our great consternation, that the wounded beast in going down the stream had caught sight of the canoe, and, instantly attacking it, had with one blow of her head capsized it. The men saved themselves by swimming; but all the loose articles were either lost or spoiled by the water." In the instance mentioned by Captain Owen, the boat was completely smashed, and sank; but, as in Dr. Livingstone's case, being close to the shore, all succeeded in landing safely. The Hippopotamus is nocturnal and gregarious in its habits. Large herds, to the number of thirty or forty and upwards, are frequently seen at one spot, some snoozing on the bank, and others noiselessly gliding through the limpid waters. They love a still reach of the stream, "and prefer to remain by day in a drowsy, yawning state; and though their eyes are open they take little notice of things at a distance." Dr. Livingstone adds, that "the males utter a loud succession of snorting grunts, which may be heard a mile off." Among the various modes of

destroying this persecuted animal, that of shooting them is of course the most effective; nevertheless, the sport is attended with much difficulty, as, when in the water, they are only vulnerable immediately behind the ear. Like the Egyptians of old, the present native Beyeye employ the harpoon, and our unhappy behemoth is drawn out of the water in all the agonies of a helpless resistance. On land the harpoon is also employed as the principal part of a trap called the "downfall." The instrument, loaded with heavy weights, is suspended from the bough of a tree, and is in connection with a string below, which being touched by the beast causes the weapon to descend on its luckless pate. The Hippopotamus is also taken in pitfalls. Its flesh is palatable, and very highly esteemed. The hide is extensively employed in the manufacture of whips or sjamboks; whilst the canine teeth are especially valuable for making artificial teeth, the ivory fetching as much as thirty shillings per pound. For these reasons, multitudes of hippopotamuses are destroyed annually.

Some naturalists believe that a smaller kind of hippopotamus found in certain parts of Western Africa ought to be regarded as a distinct species. This form was first described by Dr. Morton under the title of *Hippopotamus minor*, and subsequently as *Hippopotamus liberiensis*. One of its distinguishing peculiarities consists in the presence of only two incisor teeth in the lower jaw. Dr. Leidy has given a minute description of its osteological characters in the second volume of the *Journal of the Academy of Natural Sciences of Philadelphia*. It has even been regarded as the type of a new genus.

FAMILY IV.—TAPIRIDÆ.

In their general appearance the Tapirs manifestly approach the pigs, whilst in respect of conformity to type, their considerable bulk, associated with a proboscideiform muzzle and more exalted stature, retain a cogency of development sufficient to indicate their transitional character. If the skull of an American Tapir be

Fig. 71.



Skull of the Tapir.

examined, its form will be seen to represent a pyramid having three facets, whereas that of the hog has four. A more significant feature, however, obtains in the elevated and arched character of the nasal bones, and in the lofty interparietal ridge surmounting the vertex of the cranium (fig. 71). The jaws are furnished with forty-two teeth; that is to say, twelve incisors equally divided above and below, four canines, and

twenty-six molars, of which latter, seven occur on either side in the upper series. A wide interval separates the canines from the premolars. The spinal column possesses only four lumbar vertebræ; but there are twenty pair of ribs. The bladebone of the shoulder exhibits a deep circular notch at its anterior margin; the homologically corresponding bone of the hip, or ilium, being T-shaped. The anterior limbs are furnished with four digits; but the hind feet are tri-dactylous. The fossil genus *Palæotherium* has three toes on all the feet. The Tapirs are found inhabiting the reedy forests of tropical Asia and America, where they feed on grass and herbage.

THE COMMON TAPIR (*Tapirus Americanus*)—Plate 25, fig. 82—is a native of South America, and, though found in all parts of the continent, from the Straits of Magellan to the Isthmus of Darien, is more particularly abundant on the east coast of the continent. It stands rather high on the legs, and frequently attains a length of six feet from the extremity of the proboscideiform muzzle to the root of the tail. The hide has a deep-brown colour approaching to black, being scantily furnished with short hairs closely applied to the surface of the skin. The ears are of moderate size, the eyes small, and the muzzle extremely attenuated and prolonged into a proboscis, which is naked and flesh-coloured at the tip. The neck is surmounted by a short, bristly, black mane. The tail is insignificant. The Common Tapir is monogamous and nocturnal in its habits. Selecting the deepest recesses of the forest, it snoozes lazily during the day, and when the shades of evening gather darkness, it wanders forth to commit its nocturnal depredations along the grassy and luxurious slopes of a neighbouring stream. Herbs of every sort seem to be devoured without much selective care; and, swine-like, it occasionally swallows putrid vegetable matters, as well as all kinds of garbage. A tame specimen in the possession of D'Azara broke open and demolished the contents of a silver snuff-box! Even in the wild state, their stomachs have been found to contain various earthy products, besides pieces of wood and pebbles. The Tapir is possessed of very considerable strength; it naturally exhibits a mild disposition, but when attacked offers a stout resistance. It is easily domesticated. The flesh is coarse and insipid.

ROULIN'S TAPIR (*Tapirus villosus*) is also an inhabitant of South America. It is found, however, on mountainous slopes upwards of four thousand feet above the level of the sea. In some respects it is said to approach more closely to the Malayan species. The hide is of a dark black colour, and thickly clothed with hair. The nasal bones are more elongated than in other existing species—constituting a feature which occurs more markedly in the extinct genus above mentioned.

THE MALAYAN TAPIR (*Tapirus Malayanus*) or BABI ALU, is a native of Sumatra, Borneo, and the Malaccas. It is a comparatively rare and unknown animal, and was first introduced to our notice by Major Farquhar in 1816. Subsequently Sir T. Stamford Raffles communicated a more detailed account of this animal, which was published in the thirteenth volume of the Linnæan Society's Transactions for 1821. He

writes as follows—"The Malay Tapir resembles in form the American, and has a similar flexible proboscis, which is six or eight inches in length. Its general appearance is heavy and massive, somewhat resembling the hog. The eyes are small. The ears are rounded and bordered with white. The skin is thick and firm, thinly covered with short hair. There is no mane on the neck, as in the American species. The tail is very short, and almost destitute of hair. The legs are short and stout, the fore-feet furnished with four toes, the hind feet with three." The most characteristic feature, however, has reference to the colour of the hide; which has a deep glossy black hue generally, but is white on the rump, back, and sides of the belly, the line of demarcation being clearly defined. In the young state it is for the first three or four months more uniformly blackish above and white underneath, being at the same time "beautifully marked with spots and stripes of a fawn colour." The young specimen domesticated by Mr. Farquhar became so exceedingly familiar, that it was wont to feed, like a petted dog, on bread, cake, and all kinds of vegetables. A full-grown female measures upwards of eight feet from the tip of the nose to the base of the tail. The male is somewhat smaller.

FAMILY V.—SUIDÆ.

The various members of this family are familiarly known as swine, and are with few exceptions characterized by the possession of four toes on each foot, the anterior digits being furnished with strong hoofs; while

the posterior pair, which barely reach the ground, are likewise ungulated (Plate 33, fig. 108). The number of teeth varies; but the canines of the male are usually more or less conspicuous externally. The head is prolonged in front into a mobile truncate, snout. The tail, on the other hand, is short, or only rudimentary. The skull presents the form of a quadrangular pyramid, whose apex is represented by the extended muzzle. In the wild state swine are mostly found in low marshy forests.

THE WILD BOAR (*Sus Scrofa*) is the progenitor of all our common swine; in form and general appearance it does not differ very materially from our domestic hog (fig. 72), which has the skull rather more elevated. When provided with its full complement of teeth there are twelve incisors, equally divided above and below; four exerted, prism-shaped, recurved canines, and twenty-eight molars—in all, forty-four. The premolars are more or less compressed; the posterior grinders being tuberculated. The Wild Boar is an inhabitant of the forests of Asia and Europe generally; and although no longer known in this country, it was formerly found in Great Britain, and probably also in Sweden and Denmark. It is an exceedingly fierce and vindictive animal, capable of inflicting severe wounds on its enemies—be they men, horses, or tigers. It is doubtful whether the hunter experiences so much danger in pursuing the larger Carnivora as he does in chasing the wild hog. In India, however, this sport is much in vogue, and attended with varied excitement. During the hunt, "it is extremely common to see a party divide after

Fig. 72.



The Tame Boar (*Sus Scrofa*).

various hogs, either started at the first from the same cover, or roused in the progress of chasing a single one. Where it is known that two or more are in the bund, cane, &c., which is beating, a portion of the horse-men follow the horse that starts, leaving their comrades to manage the remainder. Nothing can exceed the interest created when, as sometimes occurs, two or three parties are following each their respective game. Some may be seen spurring on with the utmost

energy; others pulling hard to restrain their frightened or too impetuous steeds; perhaps one or more in different stages of falling; others stopping to dismount and recover spears which had missed their object; and eventually a successful Nimrod triumphing over his fallen victim." Captain Williamson also adds, that "hunted hogs, and indeed sometimes as a matter of caprice those not disturbed, will attack any object they may chance to see, such as peasants, cattle, &c. They

are greatly attracted thereto by any attempt which is made to escape from them. Such as trust to their speed are for the most part soon overtaken, and receive a cut of the tusk in each thigh, the boar putting his nose between their knees, and giving them a violent toss!" For the greater part of the year the boar is found alone, but during the spring hunters often come upon a pair and their litter. At such times the sow offers no inconsiderable resistance, and frequently punishes her enemies with a remarkably severe bite. One which attacked Captain Williamson seized him by the foot, which, on being suddenly withdrawn by the hunter, left part of the boot in her mouth! During the season of love, the boars display towards each other the most ungovernable animosity. The period of gestation extends over a space of one hundred and twenty days, the domestic sow producing from ten to fourteen pigs at a single litter. The voracity and destructive habits of the hog are too well known to require description. According to Vander Hoeven, single-hoofed varieties exist in the neighbourhood of Upsal, and also, it is stated, in some parts of Hungary. Into the merits of pork we do not enter; nevertheless it is fortunate that multitudes of people enjoy a food which is so easily accessible. As to its ancient prohibition in the East, one might almost be inclined to believe that it was originally forbidden on account of the pig's liability to be infested with young cystic larvæ or *scolicæ* of the common tape worm found in man; and yet it is perhaps necessary that the *Tenia solium* should dwell in its human host; and therefore meazled pork is occasionally eaten! We cannot here further discuss this curious question.

THE MASKED BOAR (*Sus larvatus*), or BOSCH-VARK is an inhabitant of the plains and forests of South-eastern Africa, the Cape, and the island of Madagascar. It is a large animal, between five and six feet long, and standing about two feet four inches in height at the shoulder, presenting a truly formidable appearance. Its hideousness is much increased by the presence of two nipple-like warty excrescences on either side of the muzzle near the tusks; these are supported on bony protuberances. The canines are large; the superior pair projecting horizontally. The hide exhibits a dirty brown colour, and is furnished with bristles which have a more marked development on the neck and back. The tail is about a foot long and tufted at the extremity.

THE PAPUAN BOAR (*Sus Papuensis*), or BENE, is a smaller species, scarcely exceeding half the length of the preceding, and of a much more slender build. It is tolerably abundant in the forests of New Guinea. The superior canines are comparatively feeble, resembling the incisors. The hide is clothed with short, stoutish bristles, which are ringed with black and white, the skin of the young pig is brown, the back being marked by five yellowish bands. In the young state these animals are captured and reared by the natives for food; the pork being highly esteemed, not only by themselves, but by European colonists also.

THE BABYROUSSA (*Babirussa alifurus*) is an inhabitant of Celebes, Bourou, and other easterly islands of the Indian Archipelago. By the natives it is absurdly called the stag-hog, from its standing rather high upon its legs; and the erroneous figure given by Piso in his edition of the "Natural History of East India,"

Fig. 73.

The Babiroussa (*Babirussa alifurus*).

by Bontius, is calculated to give force to this palpable misnomer. The jaws are furnished with thirty-two teeth; that is, eight incisors, four canines, and twenty molars. The canines of the upper jaw are enormously enlarged in the male; and, ascending from their sockets,

which are also directed upwards, they arch over the face, their crowns being directed backwards and downwards. The corresponding tusks of the lower jaw are also very conspicuously developed (fig. 73). The canines are not enlarged in the female, and she exhibits a more

slender build generally. So far as we are aware, the use of the large tusks in the male have not been satisfactorily explained. Those of the lower jaw are doubtless intended as defensive and offensive weapons; but as the superior pair often recurve sufficiently to touch the forehead, they cannot prove very formidable instruments of attack. It seems scarcely enough to say that they are designed to protect the eyes from injury during the animal's progress through thick bushes; and there seems more aptness in the old notion that they are employed to support the head by suspension to a bough, whilst the animal is sleeping in the standing posture. This idea, however, rests more upon theory than upon observation.

THE ÆTHIOPIAN WART-HOG (*Phacochoerus Æthiopicus*) AFRICAN BOAR, INGOOLOOB, or VALKE-VARK, is an inhabitant of the Cape of Good Hope. In common with its congeners, it is characterized by the possession of a large skull, furnished with frightful-looking tusks; those of the upper jaw are enormously developed. The teeth vary in number, the incisors being usually absent in this species. The canines are directed upwards and outwards. The molars of the permanent series are twenty in number; that is, five on either side above and below; but twelve of these become deciduous, so that in the old animal only eight may be present. The last grinder is remarkably elongated, and consists of numerous cylindrical tubes of dentine and enamel, cemented together. The Wart-hogs are provided with thick, fleshy, wen-like lobes on the cheeks, which, associated with the prominent warty excrescences below the small, sinister-looking eyes, impart additional hideousness to these animals. The

Valke-vark is about two feet six inches high at the shoulder, and nearly five feet in length. The hide exhibits a reddish-brown colour; the upper parts being clothed with long stiff bristles—those on the crown of the head radiating, as it were, from a common centre. The muzzle is broad and truncated abruptly. The tail is about twenty inches long, very narrow, and tufted at the extremity. The Valke-vark is gregarious in its habits.

ÆLIAN'S WART-HOG (*Phacochoerus Æliani*) enjoys a more extensive area of distribution over the African continent than the above; examples having been procured from Cape Verd, New Guinea, Abyssinia, and the Mozambique. It is also called the *Haruja*, or *Hallup*, and is readily distinguished from the foregoing by the presence of incisor teeth in both jaws, of which there are generally two above and six below; the bones of the forehead being also slightly depressed in this animal, but convex in the valke-vark. The hide exhibits an earth-brown colour, and is sparsely clothed with bristly hairs, except along the central line of the neck and back, where they form a well-developed mane, whose individual bristles are eight or nine inches in length. A single hair bulb commonly gives origin to several bristles. The tail is nearly naked, but tufted at the tip, as in the above. Both species live upon roots and bulbs which they grub up with their powerful tusks, aided by a kneeling posture to facilitate the wedge and lever-action of the snout.

THE COLLARED PECCARY (*Dicotyles torquatus*), or TAJAZOU, is a small kind of hog, living in Mexico and the southern districts of the United States, being at the same time more extensively dispersed over the

Fig. 74.

The Collared Peccary (*Dicotyles torquatus*).

continent of South America. The members of this genus differ from ordinary pigs in several interesting particulars:—Firstly, the hind feet are tridactylous; the outer toes being absent. Secondly, the metacarpal and metatarsal bones of the large anterior digits are

closely united. Thirdly, the canine teeth, though well developed, do not project from the mouth externally. Fourthly, the loins support a peculiar gland which exhales a fetid odour. Fifthly, there is no tail; its place being occupied by a slight prominence or

tubercle. Some other minor peculiarities exist; and Cuvier mentions that the aorta, or principal arterial trunk of the body, is very commonly enlarged or aneurismal at different parts of its course. This, however, is clearly an abnormal state, for which it is not easy to account, unless, as in the similar case of the ass, it be owing to the presence of parasites in the blood of the kind, belonging to the genus of Entozoa called *Strongylus*. The habits of the Collared Peccary are similar to those of swine in general; its food consisting of roots, bulbs, acorns, and other fruits, earthworms, grubs, and insect larvæ of all kinds, found in or upon the damp marshy soils, where this animal delights to wallow. Although the Tajazon has been domesticated, its flesh is not sufficiently soft and palatable to be employed as a substitute for common pork; and were it more pleasant it could scarcely supplant the ordinary hog, as the female only produces two young at a birth, and a full-grown individual seldom exceeds fifty lbs. in weight.

THE WHITE LIPPED PECCARY (*Dicotyles labiatus*), or TAGNIFICATE, is a larger species, weighing almost double that of the Tajazon, with which, however, it was formerly confounded. It is readily distinguished by the pale colour of the lips, the rest of the hide being brown as usual; it is also of a stouter build, the snout being likewise more prolonged and expanded at the tip. For an interesting account of the habits of this animal we are indebted to Mr. Bennett, who observes that the White-lipped Peccaries, unlike the former, "congregate in numerous bands, sometimes amounting, it is said, to more than a thousand individuals of all ages. Thus united, they frequently traverse extensive districts; the whole troop occupying an extent of a league in length, and directed in their march, if the accounts of the natives are to be credited, by a leader who takes his station at the head of the foremost rank. Should they be impeded in their progress by a river, the chief stops for a moment, then plunges boldly into the stream, and is followed by all the rest of the troop. The breadth of the river and the rapidity of the current appear to be but trifling obstacles in their way, and to be overcome with the greatest facility. On reaching the opposite bank, they proceed directly on their course, and continue their march even through the plantations which, unfortunately for the owners, may happen to lie in their way, and which they sometimes completely devastate by rooting in the ground for their favourite food, or devouring such fruit as they find there. If they meet anything unusual in their way, they make a terrific clattering with their teeth, and stop and examine the object of their alarm. When they have ascertained that there is no danger, they continue their route without further delay; but if a huntsman should venture to attack them, when they are thus assembled in large numbers, he is sure to be surrounded by multitudes, and torn to pieces by their tusks, if he is so unwise as to neglect his only chance of escape, which consists in climbing a tree, and thus getting fairly out of their reach. The smaller bands are by no means equally courageous, and always take to flight at the first attack." The White-lipped Peccary appears to belong exclusively to South America, being very abundant in the provinces of Guiana and Paraguay.

FAMILY VI.—HYRACIDÆ.

The group of small quadrupeds associated under the above title, constitute a distinct family, the members of which, though insignificant in respect of bulk and numbers, nevertheless possess a special claim upon the attention of the scientific naturalist. By those who have not studied the subject, it will hardly be credited that these little animals, formerly classed with the Rodents on account of their marked resemblance to that family, present a close approximation to the pachyderms, and more particularly to the rhinoceroses. This alliance, however, is very obvious, when we examine the condition and characters of the feet and teeth—as was, in the first instance, pointed out by Baron Cuvier, and subsequently insisted on by Wiedemann, Swainson, Lesson, Gray, and others. Regarding only the anatomical peculiarities, it would be more correct to place this family between the Tapiridæ and Rhinocerotidæ; but as its external features present so marked a deviation from those of the two families just mentioned, we prefer to consider this aberrant group in the present position—as furthest removed from the ordinary pachydermal type. The Hyracidæ are furnished with thirty-eight or forty teeth, namely, six incisors, two above and four below, and twenty-four or twenty-eight molars. In the latter case, there are no less than sixteen premolars or spurious grinders—the canines being always absent. The incisors do not exhibit a true rodent structure, but are conical and similar to those of the hippopotamus. The molars, on the other hand, are very like those of the rhinoceros; the crowns of the upper set being distinguished by two enamelled eminences, and connected by a ridge to the outer margin, whilst those below display two semi-circular ridges, whose convexity is directed outwards. The anterior limbs are furnished with four toes, but the hind feet are tridactylous. The digits are provided with small flat hoofs; a remarkable exception obtaining to the inner toes of the hind feet, which terminate in curved and sharply-pointed claws. Both as regards the skeleton and viscera, we find many other modifications of structure more or less conformable with the true pachydermal type, amongst which may be specially mentioned the existence of no less than twenty-one pairs of ribs—a number far exceeding that of any rodent, and giving a pair more than is found either in the proboscidean tapirs or elephants. In the skull the malar bone forms a complete orbital ring. The Hyracidæ are also provided with a double cæcum; and this, strangely enough, according to Professor Owen, indicates an affinity to the sloths: which edentate group, we may mention, contains an animal—the Unai—possessing a still larger number of ribs, namely, twenty-three pairs. On this subject Professor Owen, without referring to the ribs, and merely reflecting on the fact which an examination of the cæcum had suggested to his mind, very pithily remarks:—"It is interesting to find, that while the facies of Hyrax so far simulates that of a rodent as to have deceived the older naturalists, and to have concealed from them those unerring indications of its alliance with the Pachydermata which the osseous system exhibits; yet

that nature, as if in confirmation of her abhorrence to the saltus, had left in the internal structure of this singular animal an impression borrowed from the type of the Edentata." However agreeable to our taste, we cannot pursue the subject further, and have only by way of conclusion to observe, that the skin is thickly clothed with hair, the face being well supplied with stoutish bristles on the muzzle and immediately above the eyes; similar thick hairs are also here and there interspersed throughout the fur at different parts of the body. The ears of Hyracidæ are short; the tail being represented externally by a mere tubercle. Herbage and various kinds of grass constitute their food.

THE DASSE (*Hyrax capensis*), KLIPDAS or CAPE HYRAX, is an inhabitant of the mountainous districts of Southern Africa generally, both inland and along the coast. It is about the size of a rabbit, and conceals itself in the holes and crevices of rocks (fig. 75). It lives in colonies, and feeds upon grasses, aromatic herbs, and the young twigs of bushy shrubs. Should any enemy approach while the colony are basking in

the sun, as they are frequently wont to do, an alarm is immediately sounded by their sentinel, and away they all scamper to their hiding-places; the warning cry being peculiarly shrill and prolonged. The Dasse is readily tamed, and, according to Mr. Rudston Read, two examples kept by a friend of his became very agreeable companions. "They would find him out," he says, "when lying on the sofa or in bed, and, climbing up, shelter themselves on his breast within his waistcoat, or creep under the bed-clothes at his back, and, lying quiet, enjoy the warmth." Another one, "when allowed to run unconfined about the room, was inclined to be sociable, but was restless and inquisitive, climbing up and examining every person in the cabin, and startling at any noise, which caused it instantly to run and hide itself. But, from confinement, it became savage and snarling, and tried to bite when anything was put near its cage. Both wild and in restraint it is remarkably clean in its habits, always frequenting and depositing its dung in one place. From its faintly crying in its sleep we may conclude that it dreams. I

Fig. 75.

The Cape Hyrax (*Hyrax capensis*).

have also heard it," adds Mr. Read, "chewing its food by night when everything has been quiet. In its food it was pleased with variety, eating first a few leaves of one plant and then of another, and greedily licking salt when given to it. In its passage home its food was Indian corn bruised, bread, raw potato, and onion, with a small quantity of water, which, in drinking, it partly lapped and partly sucked up. It was very sensible of cold; for when a candle was placed near the bars of its cage, it readily acknowledged the little warmth given out by turning its side, and sitting still to receive the full benefit of the rays of heat. I am inclined to think that the female does not produce more than two young ones at a time, from having observed, in several instances, but two following the old ones." The flesh of the Cape Hyrax is stated to be excellent eating.

THE DAMAN (*Hyrax Sircacus*), or SYRIAN HYRAX, is a distinct species, but appears to be identical with the Abyssinian form described by Ehrenberg as the

Hyrax Abyssinicus, under which title it is also entered in the catalogue of Mammalia preserved in the British Museum. It is a native of Palestine and the mountainous borders of the Red Sea generally; it is believed to be the Shaphan of scripture history. The body is about twelve inches long, possessing a similar measurement in height. The fur exhibits a greyish-brown colour above, being fulvous at the sides, and whitish underneath; the individual hairs are annulated by these several shades; their relative amount varying according to the region of the body in which they occur. The Damans are gregarious, selecting for their habitations those inaccessible caverns and clefts, which the rocks of Syria so abundantly afford. Like the Cape Hyrax, they delight to bask in the sun near their snug retreats, exhibiting the same natural caution and timidity. The conies are, as Solomon aptly expresses it, a "feeble folk," although they have "their dwellings in the rocks."

Two or three more species have been described. Of these may be mentioned, Smith's Hyrax (*Hyrax arboreus*) from South Africa; this form possessing arboreal habits, and being distinguished by its longer fur, which also displays a white spot on the back. Another species, capable of climbing trees and feeding on their fruits, is the *Hyrax Sylvestris* of Temminck.

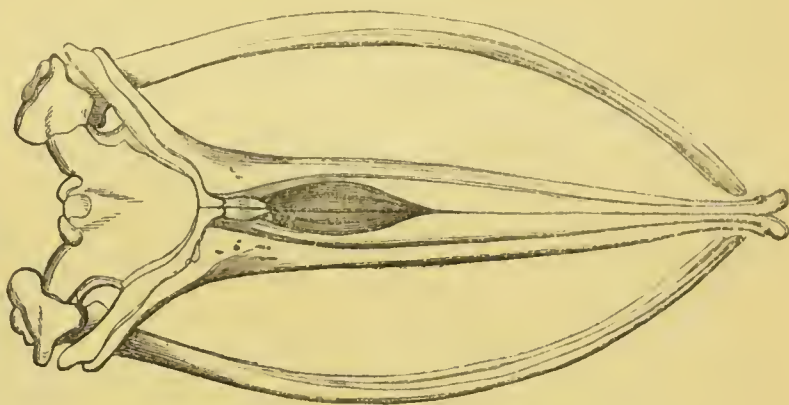
This form inhabits New Guinea and other parts on the west coast of Africa, and it is remarkable as possessing only twenty-four grinding teeth; that is, three premolars and three true molars on each side of either jaw, the orbital ring being at the same time more complete than obtains in any other member of the family.

ORDER XII.—CETACEA.

ALTHOUGH scientific naturalists have uniformly insisted on the mammiferous character of the cetacea—at least since the days of Cuvier, and also, in some degree, from the time of Linnæus—the majority of people still class them with fishes; but the only grounds on which these animals can with any propriety be said to resemble the finny tribe, are those which refer to their form and the conversion of the anterior limbs into finlike paddles. Even here, however, a close inspection of the leathery hide, of the modified limbs, and of the horizontal tail, is sufficient to indicate a wide departure from the fishes properly so called, in which the tail is vertical, the fins composed of numerous rays, and the integuments more or less converted into separable scales; and what is still more distinctive, we also find conspicuous indications of the reproductive organs externally, as well as mammary glands in the female. Anatomical investigation has likewise shown that these gigantic denizens of the deep breathe by means of lungs, and that they have a pulmonic and systemic circulation, as obtains in other mammals. Taking the skeleton of the common Greenland whale—Plate 32, fig. 90—as a type of zoophagous cetacea, it is extremely interesting to observe how its several osseous elements have become modified in form, and altered in bulk, in order to meet the exigencies of a creature destined to live in a medium so different from that generally enjoyed by the mass of mammalian vertebrates. Commencing with the head, the first thing that strikes us is the remarkable extension of the bones of the face, the inter-maxillary and superior maxillary bones arching forwards to form a kind of rostrum, whilst the lateral divisions of the lower jaw converge towards the tip of the snout, forming a curve on either side scarcely less conspicuous. The cranial bones are not less altered; the nasals are short, the temporals square-shaped, the frontals remarkably narrowed and directed obliquely outwards and backwards, the vertex of the skull being almost entirely occupied by the upper flattened portion of the occipital bone. All these characters are well displayed in the accompanying woodcut (fig. 76). If our attention be next directed to the vertebral column, we find on the one hand an almost complete abrogation of the cervical region, and a striking augmentation of the caudal elements on the other; taken as a whole, however, the bone-chain is massive and well developed. The most interesting feature in connection with this part of the

skeleton has reference to the vertebræ of the neck, which in all cases maintain their typical number, although, in the true whales, they are completely ossified

Fig. 76.



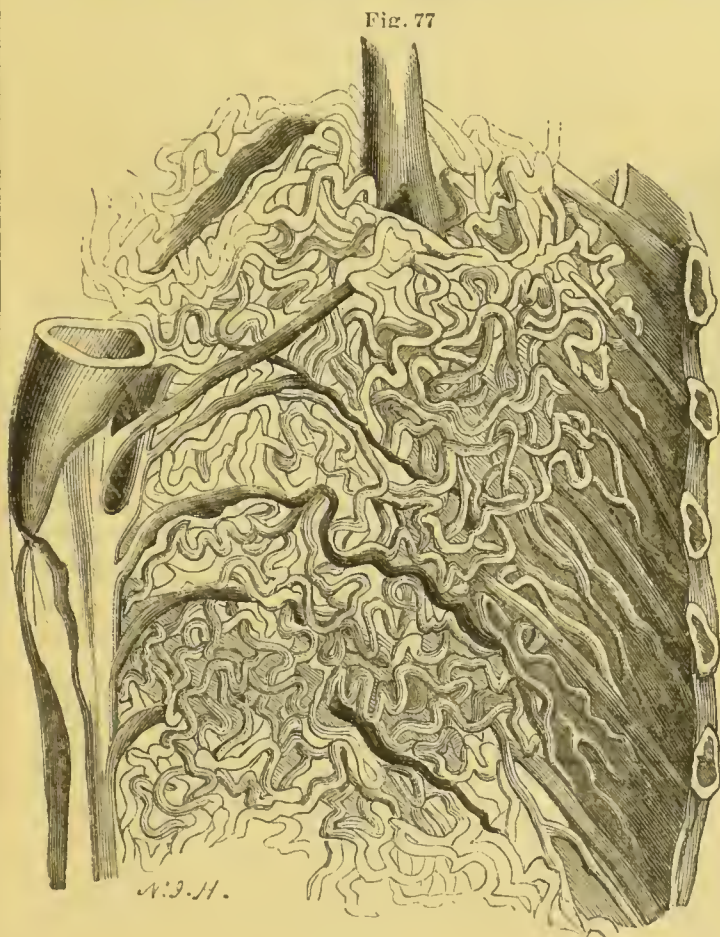
Skull of the Greenland Whale (*Balaena mysticetus*),
seen from above.

together so as to form a single mass, more or less fissured by deep clefts, which serve to indicate the original existence of seven distinct vertebræ in the embryonic condition. But this is only true of the whalebone whales, for in other members of the order the several segments are more or less free; there being six ankylosed together in the spermaceti, and two only in the piked-whales, the dolphins, and the porpoises; in the latter the first and second vertebræ are conjoined; but in the Balanopteræ the union takes place between the second and third cervical segments. In the herbivorous cetacea all the bones are permanently free, and this is also the case in the sou-sou or dolphin of the Ganges. In regard to the dorsal and lumbar vertebræ, all that we need remark is, that both series vary in number, in different genera, while their spinous and transverse processes become more and more conspicuous as they approach the caudal series. One, two, or three vertebræ have been assigned to the sacral or pelvic region, but these do not differ in structure from the previous group; and but for the existence of rudimentary pelvic bones, it would be scarcely fair to say that any should be classed in this category. The vertebræ of the tail are extremely numerous, upwards of thirty being present in the Rorqual; structurally they vary quantitatively and morphologically, gradually diminishing in bulk and complexity of outline from before backwards, until we ultimately find them reduced to a simple compressed nodule at the free extremity of the organ. Of the rudi-

mentary character of the pelvic bones we have already spoken, their attenuated form bearing no resemblance to the ilia of those quadrupeds in which the posterior limbs are present. The ribs are chiefly noticeable in respect of their mode of articulation to the dorsal vertebrae and the great degree of curvature, which is necessary to make room for the bulky thoracic viscera; a few of the anterior ribs are articulated by their heads to the bodies of the vertebrae and by a tubercle to the transverse processes, but the remainder have only a single mode of connection and have no true articular facets at their attached ends. The paddles or anterior extremities are worthy of particular consideration. In them, as has been already hinted, are to be found evidences of conformity to type, having a significance not less forcible than that enunciated when treating of the bones of the neck. Viewing the limb from without, there is nothing to indicate the parts severally denominated arm, fore-arm, and shoulders; but upon dissection we find all the osseous elements ordinarily entering into the constitution of these segments fully represented and easily recognized. With the exception of the humero-scapular articulation, all the bones are firmly invested and packed together by fibrous tissue, so as to prevent motion upon one another; and what is more noticeable, is, that they have all become shortened lengthwise, whilst their breadth has somewhat increased, as it were, by compression within the tightly investing teguments. In some species, as in the common mysticete, the digital phalanges are more numerous than usually obtains in the feet of pentadactyle quadrupeds. If we turn our attention to the skeleton of any of the herbivorous cetacea—such, for example, as that of the Dugong, Plate 34, fig. 109—not only do we observe a less considerable departure from the ordinary mammalian type, as instanced by a comparison of the bones of the hand, arm, fore-arm, and shoulder; but in contemplating the structure of the head and neck, it is evident that we have moved a step higher in the scale of organization. The seven cervical vertebrae are distinct, though still remarkably compressed from before backwards, and the skull, whilst visibly contracted in the same direction, presents, nevertheless, several peculiarities sufficiently cogent to demand special notice; these will be immediately considered when describing the general characteristics of the Manatidæ. Meanwhile we pass on to notice very briefly, some of the more striking modifications of the viscera, as well as other internal and external arrangements equally suggestive. And, firstly, as respects the organs of respiration—which are chiefly to be noted on account of their singular communication with the air by means of two nostrils situated at the top of the head in the true whales, and by a single opening similarly placed in the dolphins; in the herbivorous species these passages terminate in front of the muzzle, as in mammalia generally. Having, on several occasions, dissected the common porpoise with very great care, we are in a position to testify to the accuracy of Baron Cuvier's account of the singular manner in which the windpipe terminates, especially within a vertical extension of the pharynx, which is commonly designated the spouting apparatus, the exter-

nal openings above being vulgarly called the blow-holes. "If we trace the œsophagus upwards," says Cuvier, "we find that when it arrives opposite the pharynx, it appears to divide into two passages, of which one is continued onwards to the mouth, while the other mounts to the nose; this latter passage being surrounded with mucous glands and fleshy muscular bundles. Some of these are longitudinal, arising from the circumference of the posterior orifice of the bony nostrils, and descending along that canal to the pharynx, and its lateral path. The others are annular and appear to be a continuation of the proper muscle of the pharynx, and as the larynx rises into this passage in the form of an obelisk or pyramid, these annular fibres have the power of grasping it by their contractions. Mucous follicles which empty their secretion by conspicuous excretive orifices are abundant at this part. The lining membrane of the nasal passage having reached the vomer, assumes a peculiar texture; becoming thin, smooth, very dry, of a black colour, and apparently destitute of nerves and vessels. The two osseous nasal canals are closed at the superior or external orifice by a fleshy valve in the form of two semicircles, attached to the anterior margin of that opening, which it closes by means of a very strong muscle lodged above the intermaxillary bones. In order to open it some foreign body must press against it from below. When this valve is closed, it cuts off all communication between the nasal passages and the cavities above them. These cavities consist of two large membranous pouches formed by a dark-coloured mucous skin, which is much wrinkled when they are empty; but assuming, when distended, an oval figure, which in the porpoise equals the size of a common wine-glass. These two pouches are lodged beneath the integuments, in front of the nostrils; they communicate with an intermediate space immediately above the nostrils, the latter opening externally by a transverse semilunar slip. Very strong muscular fibres form an expansion, which closes in the upper surface of this apparatus; these fibres radiate from the whole circumference of the cranium to unite above the two pouches, being adapted to compress them forcibly. Let us suppose the Cetacean has taken into its mouth some water which it wishes to eject; it moves the tongue and jaws as if about to swallow it; but closing the pharynx, the water is forced up into the nasal passages, where its progress is accelerated by annular fibres, until it raises the valve and distends the membranous pouches above. Once in these sacs, the water can be retained there until the animal wishes to spout. For that purpose, it closes the valve to prevent the descent of the water into the nasal passages, and it forcibly compresses the sacs by means of the muscular expansions which cover them; and the fluid, thus compelled to escape by the narrow crescentic aperture, is projected to a height corresponding to the force of the pressure." Intimately connected with respiration—or rather, we should say, with the power of remaining under water for a considerable length of time without respiring—we find a special reservoir for arterialized blood; not formed however, by any unusual enlargement of the arterial trunks, but by a remarkable extension of certain small arteries which are twisted upon

themselves in various directions. Often have we gazed upon this *rete mirabile*, as it is called, with astonishment; and although it has been figured by several authors, and especially by Breschet, from whose memoir the annexed cut is given, none of these representations fully portray the singularly complicated appearance produced by these vascular tortuosities (fig. 77). This structure was first accurately described and explained by the celebrated John Hunter, who observes that "the intercostal arteries divide into a vast number of branches, which run in a serpentine course between the pleura, ribs, and their muscles, making a thick substance, somewhat similar to the spermatic artery in the bull. These vessels everywhere lining the sides of the thorax, pass in between the ribs near their articulation, and also behind the ligamentous attachment of the ribs, and anastomose with each other. The medulla spinalis is surrounded with a network of arteries in the same man-



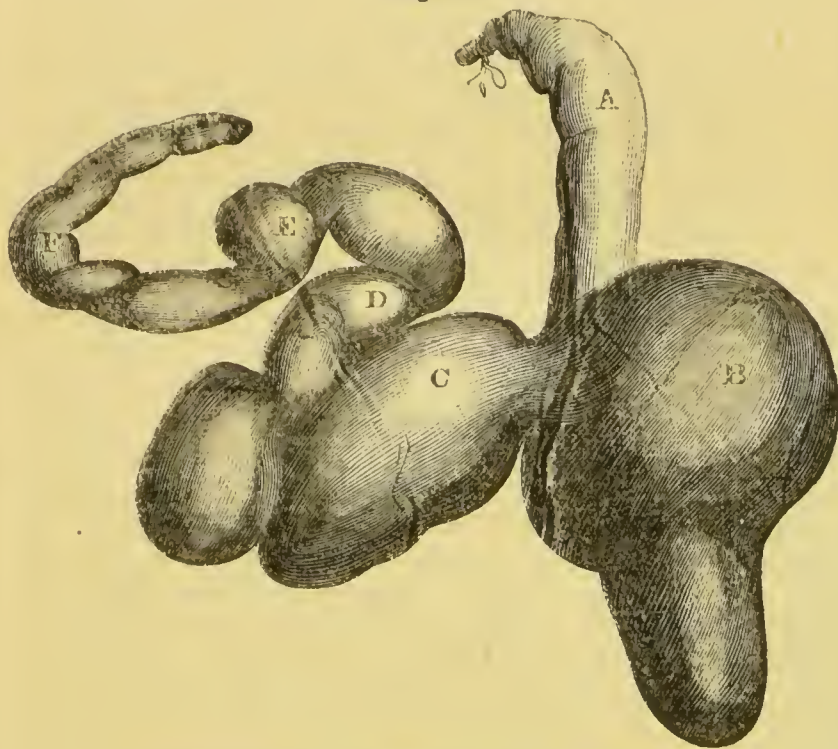
Intercostal arterial plexus or 'rete mirabile' of the Porpoise (*Phocaena communis*).

ner, more especially where it comes out from the brain, while a thick substance is formed by their ramifications and convolutions; and these vessels most probably anastomose with those of the thorax. The subclavian artery in the Piked whale, before it passes over the first rib, sends down into the chest arteries which assist in forming the plexus on the inside of the ribs. I am not certain but the internal mammary arteries contribute to form the anterior part of this plexus. The motion of the blood in such cases must be very slow." He also adds:—"The descending aorta sends off the intercostals which are very large, and gives branches to this plexus; and when it has reached the abdomen, it sends off, as in the quadruped, the different branches to

the viscera and the lumbar arteries, which are likewise very large, for the supply of that vast mass of muscles which moves the tail." As regards the function of this vascular apparatus, it is evidently connected with the power which whales have of remaining under water for a long period without coming to the surface, some species having been known, when harpooned, to be submerged for an hour and a half at a time. Co-ordinating with the habits of these animals, we also find peculiar modifications of the digestive organs. In the true whales, numerous plates of baleen are developed from the upper jaw. These laminae of horny substance, or whalebone, as it is commonly termed, are essentially developments of the cuticular layer of the skin. As their special function is to entangle within their layers various medusæ and small molluscous animals, the lower or depending end of each plate is split up into a multitude of fibres, which, acting like a sieve, render their chance of escape the more hopeless; upwards of three hundred such baleen plates occurring on either side of the upper jaw in the common mysticete. The throat of the whale is comparatively small, and consequently adapted only for the passage of minute animals; in order, therefore, to obtain sufficient food to nourish its bulky frame, it is evident that millions of creatures must be hourly swallowed. The whale having come upon a swarm of molluscs, or pteropods such as the little *Clio borealis*, multitudes are immediately entangled in the baleen; and when a sufficient number have accumulated, the enormous tongue is raised forwards and upwards, and thus by one fell swoop of this organ, the unsuspecting mass are hurled backwards towards the gullet, the water strained from them at the same time escaping upwards through the blow-hole in the form of a conspicuous *jet d'eau*. Although the full-grown mysticetes are supplied with these horny plates for the prehension of their peculiar food, it is not true to say that they have no teeth at any stage of their existence; for, in the foetal condition, as the independent researches of Geoffroy St. Hilaire, Eschricht, and Goodsir have shown, and as we have had an opportunity of witnessing, the lower jaw is furnished with numerous distinct dental sacs, each of which contains the rudiments of a separate tooth. Here again, therefore, we observe a remarkable conformity to type, in the rudimental development of organs, which, as they can never be required in after life, are consequently never brought to a state of perfection! Consistently with other peculiarities of their organisation, the stomachs of the Cetacea are all more or less complicated. Differences of opinion exist as to the degree of complexity in various species, but on the whole they do not depart materially from that which has often been described, and which we have ourselves observed to obtain in the common porpoise. In this species—as also in the white whale, from which the annexed cut (fig. 78) is taken—the organ consists of four distinct cavities; but in respect of relative bulk and function, it cannot in any measure be said to correspond with the multiple stomach of the ruminating quadrupeds. These compartments communicate with each other continuously, and are not supplied with special reservoirs, reticulations, or laminae, such as are observable in the ruminant

stomach, neither is there any inter-communicating channel common to the three first cavities, by which the aforesaid function could be maintained. In the accompanying figure A represents the œsophagus, B, C, D, and E the four stomachal compartments, F the duodenum. The only approach to any unusual extension of the internal secreting membrane, is such as is gained by the presence of numerous rugæ or foldings, which are more or less irregularly disposed throughout the entire compartments. Of the other circumstances in connection with the alimentary canal which call for particular attention, are those which refer to the great length of the intestinal tube, and to the presence or absence of a cœcum. Most of the spouting whales

Fig 78.



Compound stomach of the White Whale (Beluga Catodon).

have no cœcum, but this appendage is present in the mysticete and in the piked whale. The chylopoietic viscera exhibit several peculiarities of form which need not be dwelt upon; but we may remark, in passing, the entire absence of any gall-bladder in the zoophagous species, whilst it is present in the herbivorous forms. The reproductive organs are largely developed, the mammæ of the female being placed in the inguinal region in the true whales and dolphins, and in the pectoral region in the phytophagous manatees and dugongs. The circulatory system has already, in part, engaged our attention, but the contemplation of such a marvellous machinery in these bulky creatures deserves some further comment. The amount of muscular pressure required to propel the life stream from the voluminous cavities of the heart of a rorqual is something well calculated to excite the astonishment of any one possessing the slightest acquaintance with the principles of hydraulic power. The main arterial trunk of the spermaceti whale has a circumferential measurement of at least three feet, "and when," says the illustrious John Hunter, "we consider these as applied to the circulation, and figure to ourselves that probably ten or fifteen gallons of blood are

thrown out at one stroke, and move with an immense velocity through a tube of a foot diameter, the whole idea fills the mind with wonder." Generally speaking, the form of the heart is precisely similar to that of other mammals, but in the phytophagous dugong the apex of the heart is deeply cleft, so that the ventricles are partly detached from one another. In regard to the venous system, it should also be noted that its arrangements, in some parts, are even more plexiform than obtains in the arteries. This is particularly seen in the branches of the great anterior *vena cava*, and more especially in the veins which surround the spinal cord; whilst another still more interesting peculiarity connected with this system, is, that scarcely any of the veins are furnished with valves internally.

All these conditions are admirably adapted to the suboceanic habits of the cetaceans, and taken in connection with other structures yet to be described, manifestly indicate evidences of harmonious design. We allude here principally to the character of the dermal and subcutaneous investment of the body. This consists essentially of the same elements which enter into the composition of the hide of ordinary quadrupeds; but nearly all trace of hairs or bristles have disappeared in the zoophagous species, these structures being represented only in the embryonic condition of dolphins and in adult whales, by a few bristles attached to the anterior part of the upper or lower jaws. In some species the cuticle is rather thin, but in others it attains a remarkable development, and we have observed it to be upwards of an inch in thickness in the great rorqual. In like manner the corium acquires remarkable density and strength, passing gradually into a fatty tissue, which is commonly called the blubber, and which varies in quantity in different species, being in some found only a few inches thick, and in others

surrounding the muscles to the depth of a foot and a half or even two feet below the cuticular surface. The larger kinds of whale are capable of yielding upwards of twenty tons of oil, and as the oil is worth about £30 per ton, the "whale fishery," as it is erroneously termed, proves a very lucrative trade. Upwards of twenty thousand tons are annually brought to this country by British whalers, notwithstanding the Americans and other nations have vastly increased the competition of late years. "In 1821," says the late Professor Edward Forbes, "the British whale fishery employed one hundred and fifty-nine ships, but the decline of the northern fisheries has reduced their number to the half. We are compensated for this, however, in the energy and success with which our Australian colonies are joining in the business; and the rich source of blubbery wealth which the north once was, the south now promises to be. At present we are beaten in whaling by our American cousins; but the great advantages presented by the proximity of Australia and the Auckland Isles to the southern whaling grounds, are giving us a fresh start, of which we will not be slow to avail ourselves. In 1844 the American whaling fleet numbered no fewer than

six hundred and fifty vessels, tonnage two hundred thousand tons, and manned by seventeen thousand five hundred men. In 1848 the number was slightly under this estimate, though including one-tenth of the entire shipping of the United States. The social importance of this fishery will be at once appreciated, when it is stated that, about twenty years ago, it was estimated that as many as seventy thousand persons in the United States derived their chief employment and subsistence, in one way or another, from the whale fisheries; and the number so deeply interested in them must be even greater at present. Other countries, besides Britain and America, have but a small share of these profits: some sixty or seventy vessels from French, German, and Danish ports, make up the number of whalers. It must not be forgotten, however, that the indefatigable Hollanders had at one time a lion's share of the whole fishery to themselves—as long ago as 1680, there were fully two hundred and sixty ships, and fourteen thousand Dutchemen employed in the trade—nor that the first professional whalers and original harpooners were Biscayans."

We have thus diverted somewhat from the immediate subject-matter of our description, in order to convey some adequate idea of the immense quantities of oil yielded by the Cetacea, which, in proportion to the blubber itself, is as three to four. Most of the oil is derived from this source, but it should also be mentioned that the cellular tissue of the tongue and the interior of the large bones, especially those of the lower jaw, likewise contain a large quantity of oil. The fatty matter termed spermaceti, which is found only in a particular group of whales, is derived chiefly from the head of these animals. According to John Hunter, "the purest spermaceti is in the smallest and least ligamentous cells; it lies above the nostril, all along the upper part of the head, immediately under the skin and adipose membrane. These cells resemble those which contain the common fat in the other parts of the body nearest the skin. That which lies above the roof of the mouth, or between it and the nostril, is more intermixed with a ligamentous cellular membrane, and lies in chambers whose partitions are perpendicular. These chambers are smaller the nearer to the nose, becoming larger and larger towards the back part of the head, where the spermaceti is more pure. This spermaceti when extracted cold, had a good deal the appearance of the internal structure of a water melon, and is found in rather solid lumps." Chemically speaking, it closely resembles the substance termed cholesteroline, and like it, after being melted, concretes into thin crystalline laminae of a silvery hue and peculiar greasy feel. In addition to these matters there is yet another substance found in the intestines of Cetacea, which, though not much sought after, is nevertheless of considerable value. This is ambergris. It is a concretionary formation, of a mottled, greyish colour; and when split open, it is found to contain a large number of the horny beak-like processes of cuttle-fishes, derived from the cephalopodous molluscs, on which the spermaceti whales delight to feed. It has a peculiar

strong, diffusible odour, and when pure is soft and waxy on section; chemically speaking, it consists of a fatty substance or principle termed ambreine. Ambergris is used to impart an agreeable flavour to certain wines, and one or two grains, mixed and triturated with sugar, is sufficient to flavour a hogshead of claret.

The special organs of sense in Cetacea are constructed on the same plan as those of terrestrial quadrupeds, but, nevertheless, exhibit several peculiarities adapted to their aquatic habits. These are particularly noticeable in the organs of hearing and vision. Externally there is no auricular appendage, and the meatus auditorius is only represented by a very small aperture, scarcely large enough to admit the introduction of a small crow-quill. Internally, the essential part of the auditory apparatus, including the ossicles, are invested by an osseous framework distinct from the ordinary bones of the cranium which inclose the organs of hearing in other Mammalia. The osseous capsule consists of two distinct portions inclosing the labyrinth and tympanum. The tympanic bone is particularly hard, and very largely developed, having commonly a more or less kidney-shaped outline. This part is usually called the ear-bone, and owing to its density and power of resisting decay and disintegration, we find it very perfectly preserved in the tertiary marine deposits along the Suffolk coast, where multitudes of them are found associated with other water-worn osseous fragments in the phosphatic pseudocoprolitic beds. Some specimens in our possession, evidently belonging to a species of porpoise, are very highly silicified, the petrous or labyrinthic bone remaining *in situ*, and displaying very clearly the spiral groove of the cochlea and the semicircular canals. As to the capacity of hearing enjoyed by Cetacea, much difference of opinion exists—the excellent authority, Scoresby, averring that they are not roused even by the report of a cannon; whilst others, who have also been engaged in whale-fishery expeditions, state that their powers both of hearing and vision are sufficiently acute to render the approach of the harpooners at all times difficult and sometimes unsuccessful. The eye is chiefly remarkable for the great thickness of its external or sclerotic coat, an arrangement calculated to maintain in its integrity the ellipsoid form of the crystalline lens and vitreous humour, which would otherwise yield to the pressure of the aqueous medium in which the animal swims. Ordinary whales have no true lachrymal glands, but these organs are present in the herbivorous cetacea, which latter are also furnished with a third eyelid or nictitating membrane. The brain of all the Cetacea is well formed, and provided with numerous convolutions. Though of large size in itself, it is remarkably small as compared with the bulk of the body, representing by weight in the common mysticete only the one three-thousandth part of the entire animal. The cerebellum is comparatively bulky; whilst, of the nerves which proceed from the base of the brain, the most remarkable are those which pass to the organ of hearing—their conspicuity being especially manifested in the dolphins.

FAMILY I.—BALÆNIDÆ.

This family consists of the true whales, which are distinguished from the cachalots, the dolphins, and the herbivorous cetacea, by the possession of plates of whalebone, or more properly baleen, depending from the palatal region of the upper jaw. They have no true teeth, although, as we have seen, there are tooth-sacs developed in the lower jaw of the embryonic mysticete. The true whales are further recognized by their preposterously large heads, which in some of the species extend to one-third of the entire length of the body. The nostrils are distinct and longitudinally disposed on the crown of the head. The mammary glands are placed in the inguinal region—an arrangement which also obtains in the cachalots and dolphins. The intestine is furnished with a cœcum.

THE MYSTICETE (*Balæna mysticetus*), or common Whalebone whale—Plate 28, fig. 89—is also known as the Greenland whale, and in Dr. Gray's catalogue of the Cetacea preserved in the British Museum it is called the Right whale—this term being also applied to the Cape whale (*Balæna australis*) by the South Sea whalers. Our best accounts of the Greenland whale are all more or less derived from the Rev. Dr. Scoresby's "Journal of a Voyage to the Northern Whale-fishery," and from a paper in the first volume of the Wernerian Society's Transactions, from which the following description is abridged. When full grown this species is from fifty to sixty-five feet in length, and from thirty to forty in circumference, immediately before the fins. It is thickest a little behind the fins, and from thence gradually tapers towards the tail, and slightly towards the neck. It is cylindrical from the neck, until near about the junction of the tail and the body, where it becomes ridged. The head has a triangular shape. The bones of the head are very porous, and full of a fine kind of oil. When the oil is drained out, the bone is so light as to swim in water. The jaw-bones are from twenty to twenty-five feet in length, and the space between them is about ten feet from side to side. The tongue is of great size, and yields upwards of a ton of oil; and the lips, which are placed at right angles to the flat part of the base of the head, yield fully double that amount. The palatal laminae of baleen are not of equal length; neither are the largest exactly in the middle of the series, but somewhat nearer the throat; from this point they become gradually shorter each way. On each side of the mouth are about two hundred laminae of whalebone. They are not perfectly flat; for, besides the longitudinal curvature, they are curved transversely. The largest laminae are from ten to fourteen feet in length, very rarely fifteen feet. The breadth of the largest at the thick ends, or where they are attached to the jaw, is about a foot. The Greenland fishers estimate the size of the whale by the length of the whalebone; and when the baleen is six feet long, then the whale is said to be a *size fish*. In *suckers*, or young whales still under the protection of the mother, the whalebone is only a few inches long. It is immediately covered by the under lips, the edge of which, when the mouth is shut, overlap the upper

part. The colour of the hide is black, grey, and white, with a tinge of yellow about the lower part of the head. The back, upper region of the head, most of the belly, the fins, tail, and part of the under jaw, are deep velvet-black. The anterior aspect of the lower jaw, and a portion of the abdomen are white; the narrow portion near the junction of the tail being greyish. The skin of suckers has a pale bluish tint. The cuticle or scarf-skin is only as thick as ordinary parchment, whilst the true skin is from three-fourths to an inch in thickness all over the body. The Greenland whale is not provided with a dorsal fin. The flippers, which are situated about two feet behind the angle of the jaws, measure nine feet in length, and rather more than half the same amount in breadth. The tail is compressed, semilunate, notched at the centre, and sometimes as much as twenty feet in breadth.

Notwithstanding the many exaggerated statements to the contrary, the Greenland whale seldom or ever exceeds fifty-eight or sixty feet in length. It is a slow swimmer, going at the rate of four miles an hour, though when harpooned, it is said to dive perpendicularly downwards at a speed of seven knots an hour. It occasionally ascends with sufficient force to throw itself entirely out of the water. It seldom remains submerged longer than twenty or thirty minutes, and when it rises again to the surface, it will remain there about the same time if not disturbed. In calm weather it is wont to sleep in this situation. One of the most moving and painful sights which can be imagined, is witnessed when the whale-fisher strikes a sucker, in order to secure its dam; whilst to say nothing of the unnecessary cruelty, it is more than probable that this inhuman practice entails serious injury to the fishery business, by greatly diminishing the chances of future success. According to the testimony of Scoresby, "the young is frequently struck for the sake of its mother, which will soon come up close by it, encourage it to swim off, assist it by taking it under its fin, and seldom deserts it while life remains. It is then very dangerous to approach, as she loses all regard for her own safety in anxiety for the preservation of her cub, dashing about most violently, and not dreading to rise even amidst the boats. Except, however, when the whale has young to protect, the male is in general more active and dangerous than the female." The period of gestation is believed to extend over a space of about ten months. In addition to its powerful and relentless human adversary, the Mysticete has to contend with other enemies, such as the shark, the thrasher, and the sword-fish. It is itself, however, a great destroyer of life; its principal food consisting of shoals of a small pteropodous mollusc, specifically known as the *Clio borealis*. Although the aperture of the throat is scarcely sufficient to admit the introduction of an ordinary hen's egg, yet to satisfy so prodigious a bulk of body, it is evident that myriads of these little creatures must go to form a single meal—and if so, what must be the annual consumption of this huge monster of the deep? Well may Mr. Darwin argue that for every animal which passes through a full cycle of its life, ten thousand perish ere they have reached maturity! Into details respecting the perils encountered by those embarked in the whale fishery,

we cannot here enter. Full particulars are given in Dr. Scoresby's work. Let it suffice us to observe that between the years 1669 and 1778 the Dutch sent 14,167 ships to the shores of Greenland, and of these 561 were wrecked, no less than 73 having been lost in a single season.

The Greenland whale has occasionally strayed to the northern shores of Scotland and the Zetland Isles; those that have run aground being always found in a very impoverished condition. Even in this state, the monster was in olden times deemed a "Royal fish," and according to Pennant, or the still more authoritative Commentaries of Blackstone, when the whale was accidentally cast ashore the reigning monarchs divided the spoil—"the king asserting his right to the head, her majesty to the tail!"

Of other whales belonging to the genus *Balæna*, we have only space to particularize the following:—The western Australian whale (*B. marginata*) which is furnished with very long and slender baleen; the New Zealand whale, or Tuku Peru (*B. antarctica*) which attains a length of sixty feet; the Cape whale (*B. australis*) which is also an inhabitant of the southern ocean and of a uniformly deep black colour; the Japanese whale (*B. japonica*) which is very imperfectly known; and the Serag whale (*E. gibbosa*) an Atlantic species, which is characterized by the possession of a series of knob-like protuberances along the middle line of the hinder region of the back, forming a sort of transition to the fin-backed whales. The genus *Megaptera* is, indeed, closely allied to the above species, and following the classification and nomenclature adopted by Dr. J. E. Gray in his synopsis of the cetacean families contained in the British Museum, we have further to indicate the principal members of the hump-backed genus, there specified, as follows:—Johnston's Hump-backed whale (*Megaptera longimana*) which is a common inhabitant of the northern seas—Dr. Johnston of Berwick described it from a specimen accidentally thrown ashore at Newcastle; the Bermuda Hump-back (*M. Americana*), whose head is covered with tubercles or nodulations, the hide being black above and whitish underneath; the Cape Hump-back or Poeskop (*M. Poeskop*); and the Kuzira (*M. Kuzira*), the latter being found off the coasts of Japan. The genus *Balænoptera* is represented by a single species commonly known as the Pike whale (*Balænoptera rostrata*). A great deal of confusion, however, still exists in reference to this species and until the points are more satisfactorily cleared up, we are scarcely in a position to describe it with confidence. According to Dr. Gray, it is identical with the *Rorqualus Boops* of F. Cuvier. It is an inhabitant of the northern seas, and has a black colour above, being reddish-white underneath the belly. A specimen is said to have been captured in the Thames near Deptford, but this example has been considered, by several authorities, only as a young example of the Great Northern Rorqual. Dr. Collingwood in his admirable little "Fauna of Blackheath and its vicinity," has recorded the circumstance as follows:—"On Sunday, October 23, 1842, a whale was observed in the Thames opposite Deptford Creek. Five men put off in

a boat, and attacked it with a large bearded spear; and having pushed it immediately under Deptford Pier they overcame and despatched it. Having by mechanical appliances raised it upon the pier, its dimensions were ascertained to be—total length 14 feet 6 inches; length from nose to angle of mouth, 3 feet 10 inches; tail from fork to fork, 3 feet 10 inches. A full account of this whale is to be found in the *Zoologist* for 1842, with a figure; also an account of its capture, with a sketch of the animal, is to be seen in the *Illustrated London News*, vol. i. p. 388." Similar difficulties exist in regard to the determination of the specific characters of the Great Northern Rorqual of Dr. Knox, which, according to Dr. Gray, is identical with—

THE RAZOR-BACK (*Physalus Antiquorum*); and knowing the careful research which this eminent mammalogist has bestowed upon the subject, we shall assume his determinations in this respect to be correct. We have ourselves frequently examined the skeleton of Dr. Knox's celebrated specimen, so satisfactorily preserved and exhibited in the elephant-house of the Edinburgh Zoological Gardens, and we can therefore testify to the accuracy of the details given by the three eminent authorities on comparative anatomy who dissected it. Those who are interested in the details should consult Dr. Knox's original description published in the Transactions of the Royal Society of Edinburgh for 1827, or his more recent memoir—entitled "Contributions to the Anatomy and Natural History of the Cetacea"—recorded in the 3rd volume of the Journal of the Proceedings of the Linnæan Society. If Dr. Gray's views are right, it would appear that the whale taken at Black Gang Chine, Isle of Wight, in 1842, is also referable to this species; whilst the same may be said of specimens taken both at Berwick and at Plymouth in 1831. Another example was taken off the coast of Ostend in the early part of the present century, and the skeleton subsequently exhibited in London, near the King's Mews, Charing Cross. The hide of the Razor-back has a slatish-grey colour, being whitish underneath; the under border of the baleen, which is short, is blackish, the inner edge being pale-streaked. It is an inhabitant of the northern ocean. Respecting its habits, Mr. Bell remarks, that they "are different from those of the common whale. It is less quiet and tranquil in its general movements, seldom lying motionless on the surface of the water whilst blowing, but making way at the rate of about five miles an hour. When struck, the velocity of its descent is such as very frequently to break the line, of which Captain Scoresby mentions several instances." It is very doubtful if this species ever attains a length of upwards an hundred feet, though examples have been recorded which were only a few feet short of this measurement.

Dr. Gray has given the scientific appellation of *Physalus Boops* to a form which he considers quite distinct from the above, and which we may therefore more simply particularize as Gray's Fin-back whale. A specimen of this whale was captured off the Welsh coast in the year 1846, and it is now preserved in the British Museum under the above title. It is thirty-eight feet in length, has sixty vertebræ, and fifteen pairs of ribs. The head alone measures nine feet in length.

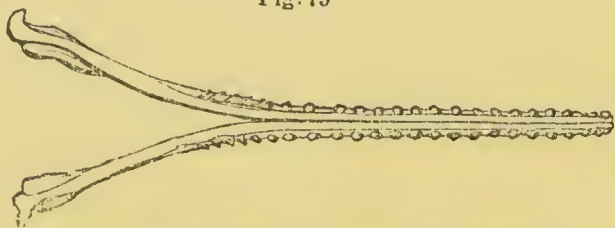
Several other species of the genus *Physalus* are indicated in the Museum catalogue.

FAMILY II.—CATODONTIDÆ.

The members of this family are sometimes described under the synonymous and equally distinctive title of *Physeteridæ*, which includes the cachalot or spermacetes, and the short-headed whales. These animals have the nostrils separate and longitudinally disposed; their palate is smooth and destitute of baleen; whilst a still more characteristic feature is seen in the presence of numerous large conical teeth in the lower jaw (fig. 79), the upper jaw being edentulous, or furnished with mere rudiments of teeth beneath the gums. The head, though comparatively short in some, is enormously developed. The intestine has no cœcum.

THE NORTHERN SPERM WHALE (*Catodon macrocephalus*), or COMMON CACHALOT—Plate 27, fig. 87—is also known as the Blunt-headed Cachalot, and the Spermaceti whale; generically, it is at once recognized by its elongated head, which is abruptly truncated anteriorly, the blowers being placed near the extremity of the snout, and the dorsal hump is rounded. In its native haunts, this huge monster is found in the northern seas, but

Fig. 79



Jaw-bone of the Cachalot (*Catodon macrocephalus*).

it occasionally visits our own shores. An example was cast ashore on Cramond island, in the Frith of Forth, on the 22d of December, 1796; its length was fifty-four feet, and the greatest circumference, at a point immediately beyond the eyes, thirty feet; the upper jaw being ascertained to be five feet longer than the lower, which measured ten feet, and was provided with twenty-three teeth on either side. The largest tooth was eight inches long, its circumferential measurement being the same. It was described and accurately figured by Mr. James Robertson, in the 60th volume of the *Philosophical Transactions*. The occurrence of the Cachalot on the shores of the Orkney and Zetland islands is by no means a rare circumstance, but it is very seldom taken on the English coasts. That it does occasionally visit our shores, has been satisfactorily shown by Dr. Collingwood, to whom naturalists are indebted—to use his own words—for resuscitating “a still-born record of the Spermaceti whale,” which he found in a document contained in Sir Joseph Banks’ copy of the *Philosophical Transactions* in the British Museum. It is entitled an “Extract from a letter from Walberswick, on the coast of Suffolk, dated March 7, 1788,” and runs as follows:—“A whale appearing on our coast is a rare phenomenon. The most extraordinary instance that ever happened of this sort was in February, 1763, after a hard gale of wind northerly, when no less than twelve whales, which

undoubtedly came out of the Northern Ocean, were towed and driven on shore at the following places, all of them dead, and in a high state of putrefaction, excepting one.” This notable exception was “one at Hope Point, in the River Thames. This was the only one seen alive. He ran aground and smothered himself in the mud, and was afterwards made a show of in the Greenland Docks. These were all of the spermaceti kind, and of the male gender;” “and it is remarkable,” adds Dr. Collingwood, “that out of the twelve, (or rather ten, for two stranded on the Dutch coast,) six were found upon the coast of Kent. From an old engraving of the above specimen in my possession, to which a scale is attached, it appears to have been near sixty feet long. Within a much more recent period, a small Cachalot was captured in the Thames, near Gravesend, but I am not in possession of any particulars of the event.” The Cachalot is gregarious in its habits, large multitudes of them herding together. By the South Sea whalers they are termed “schools;” sometimes all consisting of females, and at other of males not fully grown. One or two large “bulls,” or “school-masters,” as they are ridiculously termed, usually accompany the female herds, and Mr. Beale reckons that he has seen as many as six hundred individuals of the southern species in a single school! The female is comparatively small, and produces one, and sometimes two young, at a birth. The two recorded by M. F. Cuvier, which were brought forth by a whale stranded on the French coast, near D’Audierne, were each about ten feet in length. The young are of a deep black colour, and mottled with whitish spots.

THE SOUTHERN SPERM WHALE (*Catodon polycyphus*) very closely resembles the northern species, both in respect of its size and habits. It has the same large head and characteristic jaws, the lower being lodged in a groove of the upper, whilst the crowns of the teeth fit into corresponding socket-like cavities, so as to be entirely concealed when the mouth is closed. The southern Sperm whale, or Cachalot, occasionally attains a length of seventy or eighty feet, and a specimen has been minutely described by Mr. Beale which measured eighty-four feet. The skin is usually smooth and dark coloured, almost black; but piebald varieties occur, as well as other differences in the depth of shading. “Old bulls,” says Mr. Beale in his work on the Sperm whale, “have generally a portion of grey on the nose, immediately above the fore-part of the upper jaw, when they are said to be grey-headed.” The same authority observes that the head—which we stated in our introductory observations to contain a large quantity of oil—is “specifically lighter than any other part of the body, and will always have a tendency to rise at least so far above the surface as to elevate the nostril or blow-hole sufficiently for all purposes of respiration; and, more than this, a very slight effort on the part of the whale would only be necessary to raise the whole of the anterior flat surface of the nose out of the water. At very regular intervals of time, the snout emerges, and from the extremity of the nose the spout is thrown up, and at a distance appears thick, low, bushy, and white. It is formed of the expired air, forcibly ejected through the blow-hole, and acquires its white colour from

minute particles of water previously lodged in the chink or fissure of the nostril, and also from the condensation of the aqueous vapour thrown off by the lungs. The spout is projected at an angle of 136° , in a slow and continuous manner, for about three minutes, and may be seen from the mast-head in favourable weather at the distance of four or five miles. When the whale is alarmed or "gallied," the spout is thrown much higher with great rapidity, and differs much from its usual appearance. Immediately after each spout the nose sinks beneath the water, scarcely a second intervening for the act of inspiration, which must consequently be performed very quickly, the air rushing into the chest with astonishing velocity. There is, however, no sound caused by inspiration, and very little by expiration, in this species; in short, nothing of that loud noise called the "draw-back" in the finback and other whales. Ten seconds is occupied by a large bull sperm whale in making one inspiration and one expiration; during six of these the nostril is beneath the water. At each breathing time the whale makes from sixty to seventy expirations, and remains, therefore, at the surface ten or eleven minutes. When the breathing time is over, or, as the whalers term it, he has his "spoutings out," the head sinks slowly; the "small," or the part between the "hump" and the "flukes," appears above the water, curved with the convexity upwards; the flukes are then lifted high into the air, and the animal having assumed a straight position, descends perpendicularly to an unknown depth. This last act is called "pecking the flukes," and those who are on the look-out call loudly when they see it—"There goes flukes." The whale continues thus hidden beneath the surface for one hour and ten minutes; some will remain an hour and twenty minutes, and others only for one hour; but these are rare exceptions. Mr. Beale gives us very graphic accounts of the mode of capturing the Sperm whale, which, when excited, seems to be a truly formidable antagonist. Perhaps, however, the most stirring incident, amongst the many daring encounters which have from time to time been recorded, is that given by the Rev. Henry T. Cheever, in his little work entitled "The Whaleman's Adventures in the Southern Ocean," which is edited by that distinguished navigator and cetaceologist, the Rev. Dr. Scoresby. Thus runs the terrible story:—"The most dreadful display of the whale's strength and prowess yet authentically recorded, was that made upon the American whale ship *Essex*, Captain Pollard, which sailed from Nantucket for the Pacific Ocean in August, 1819. Late in the fall of the same year, when in latitude 40° of the South Pacific, a school of sperm whales was discovered, and three boats were manned and sent in pursuit. The mate's boat was struck by one of them, and he was obliged to return to the ship, in order to repair the damage. While he was engaged in that work, a Sperm whale, judged to be eighty-five feet long, broke water about twenty rods from the ship, on her weather bow. He was going at the rate of about three knots an hour, and the ship at nearly the same rate, when he struck the bows of the vessel, just forward of her chains. At the shock produced by the collision of two such mighty masses of matter in motion, the ship shook like a leaf.

The seemingly malicious whale dived and passed under the ship, grazing her keel, and then appeared at about the distance of a ship's length, lashing the sea with fins and tail, as if suffering the most horrible agony. He was evidently hurt by the collision, and blindly frantic with instinctive rage. In a few minutes he seemed to recover himself, and started with great speed directly across the vessel's course to windward. Meanwhile the hands on board discovered the ship to be gradually settling down at the bows, and the pumps were ordered to be rigged. While working at them, one of the men cried out—"God have mercy! he comes again!" The whale had turned at about one hundred rods from the ship, and was making for her with double his former speed; his pathway white with foam. Rushing head on, he struck her again at the bow, and the tremendous blow stove her in. The whale dived under again and disappeared, and the ship filled and fell over on her broadside, in ten minutes from the first collision. After incredible hardships and sufferings in their open boats, on the 20th December the survivors of this catastrophe reached the low island called Ducies, in latitude $24^{\circ} 40'$ south, longitude $124^{\circ} 40'$ west. It was a mere sand-bank, nearly barren, which supplied them only with water and, very scantily, sea-fowl. On this uninhabited island, dreary as it was, three of the men chose to remain, rather than again commit themselves to the uncertainties of the sea. They have never since been heard from, the island being seldom visited. On the 27th of December the three boats, with the remainder of the men, put away together for the island of Juan Fernandez, at a distance of two thousand miles. The mate's boat was taken up by the *Indian* of London, on the 19th of February, ninety-three days from the time of the catastrophe, with only three survivors. The captain's boat was fallen in with by the *Dauphin* of Nantucket, on the 23rd of the same month, having only two men living, whose lives had been eked out only through that last resort of hunger in the wretched, which words shudder to relate! Out of a crew of twenty, five only survived to make the ear of the world tingle at their strange eventful story."

Several other forms of Cachalot exist, which are considered by Dr. Gray and others as entirely distinct species. These are the Mexican Sperm Whale (*Catodon Colucti*); the Short-headed Whale (*Kogia breviceps*), which occurs in the neighbourhood of the Cape; and the Black-fish, or High-finned Cachalot (*Physeter Tursio*), which is undoubtedly distinct. This latter species, according to the testimony of Mr. Barclay, communicated to Mr. Bell, is frequently seen off the coasts of Zetland in summer. It was first described by Sir Robert Sibbald, who compared its long perpendicular dorsal fin to the mizen-mast of a ship. The specimen from which his description was taken was cast ashore on the Orkney isles in the year 1687.

FAMILY III.—DELPHINIDÆ.

Under this head naturalists have included a great number and variety of cetacean species, which are collectively recognized by their double rows of teeth, or, in other words, by teeth in both jaws. They have smooth

palates, and the nostrils are united into a single, lunate, transversely disposed blow-hole. In some species the teeth are deciduous; in all they are simple in structure, and of a more or less conical form; the head is likewise of moderate size. The intestinal canal is not furnished with a cecum.

THE BOTTLE-HEAD (*Hyperoodon Butzkopf*) is an inhabitant of the north sea, and occasionally makes its appearance on our shores. It is readily distinguished by the attenuated character of the fore-part of the muzzle, which is prolonged so as to resemble a beak, and was, in consequence, termed the Beaked whale by Pennant. The earliest account we have of its occurrence, is that given by Dale in his "History of Harwich," from a specimen taken off the coast, near Maldon, in the year 1717. Its length was fourteen feet, the circumference of the body seven and a half; the flippers being seventeen inches, and the dorsal fin a foot in length. On this subject Dr. Collingwood makes the following remark in his *brochure* previously cited:—"In the Philosophical Trans. for 1787, in the paper by Hunter 'On the structure and economy of whales,' is a meagre account of bottle-nosed whales with two teeth, with a figure of the animal. Hunter adds, that 'it was caught above London bridge in the year 1783, and became the property of the late Mr. Alderman Pugh, who very politely allowed me to examine the structure, and take away the bones. It was twenty-one feet long.' Mr. Bell's figure is a reduced copy of our whale as given by John Hunter. Hunter was doubtful of its species, saying, that it resembled *Delphinus Tursio* (the Bottle-nosed dolphin), but was of a different genus, having only two teeth in the lower jaw, concealed by the gum. The belly was white, shaded off to the dark colour of the back. He, however, rightly conjectured that it was the species described by Dale ("Harwich," 411, pl. 14), viz. *Hyperoodon Butzkopf*, and supposes it to have been a young one, as he mentions a skull which must have belonged to one thirty or forty feet long." Dr. Collingwood has, we fear, in the remaining part of his "note" confounded Dale's and Hunter's specimens, and has called the editor of Pennant to account for a discrepancy in respect of measurement—himself altogether overlooking the circumstance, that Dale's specimen was stranded seventy years before Hunter's example appeared in the Thames. In our edition of Pennant (1776) the length of the Maldon specimen is correctly given as fourteen feet, and thus corresponds with the original description; in the edition to which Dr. Collingwood refers, it is given as eleven feet, which is probably a misprint. In conclusion, we may observe, that a series of careful dissections of another example of this rare and interesting cetacean may be seen in the Anatomical Museum of the University of Edinburgh.

THE NARWHAL (*Monodon monosceros*)—Plate 27, fig. 86—or Unicorn-whale, is readily distinguished by its remarkable tusk-like tooth which projects several feet in a horizontal direction from the left side of the upper jaw; the tooth of the opposite side being imperfectly developed, and remaining permanently concealed within the alveolus. It is not certain whether these teeth should be regarded as incisors or canines, as

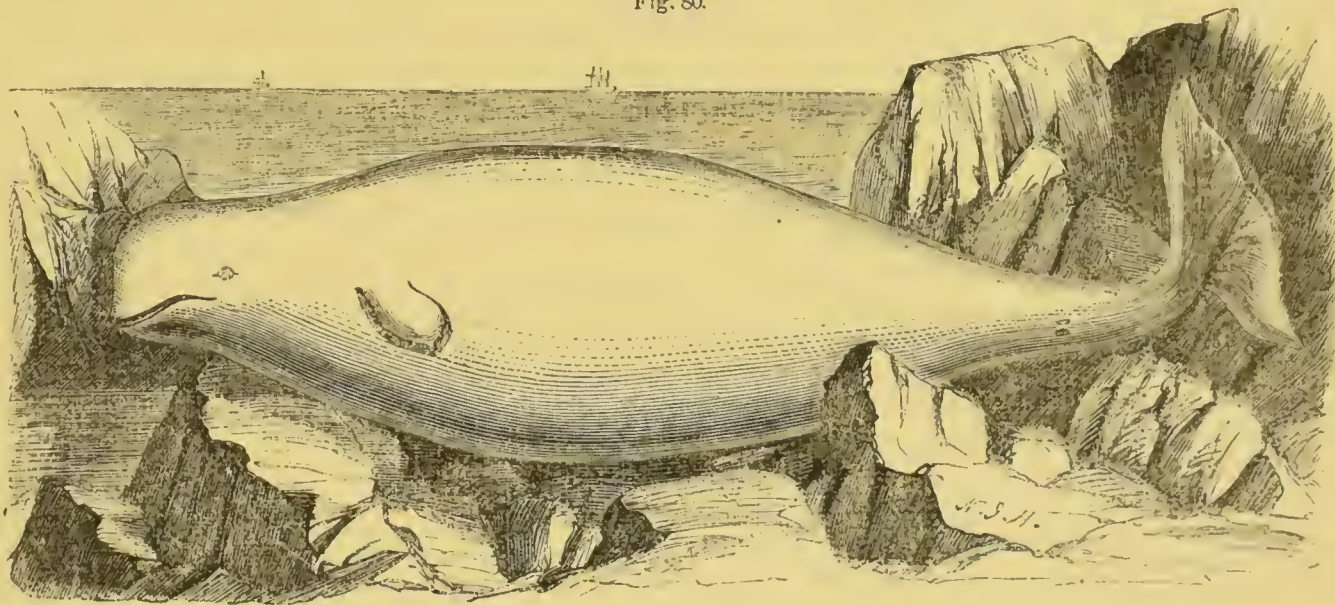
their sockets are placed between the maxillary and internaxillary bones; yet, from the circumstance of the base of their roots being somewhat in front of the incisio-maxillary suture, we incline to the persuasion that they are incisors. The left nostril is smaller than the right. The colour of the adult Narwhal is dark above, whitish and marbled at the sides, underneath; in young individuals the hide is uniformly black. The Narwhal is a swift swimmer, and gregarious in its habits; and as it feeds chiefly upon small molluscous animals, it is difficult to say what is the express purpose of the large tusk. According to Dr. Scoresby, it is employed to destroy large fishes, such as skates and turbot, specimens of this whale having been found to contain the remains of such fishes in their stomachs. The Greenland missionary, Mr. Egede, a translation of whose work was published in London in 1745, stated that the tusk is used in piercing ice for the purpose of enabling the creatures to obtain fresh air, without always seeking the open water. Others regard it simply as a weapon of offence and defence, and many exaggerated accounts of its powers in this respect have been recorded by Lacépède and others. The ivory of the tusk is very white and dense, and capable of yielding a high polish. Lacépède, in his "Histoire Naturelle des Cétacées," gives a figure of the head of a Narwhal in which both of the teeth were developed to nearly equal length. The quality of the oil obtained from the blubber is superior, and the flesh is much prized by the Greenlanders. Several instances have been recorded of this animal's appearance on our shores. The first is that described by Tulpins in 1648, the specimen being twenty-two feet long. Another was thrown on the Lincolnshire coast, near Boston, in 1800, and a third was found close by the shore, at the entrance of the sound of Weesdale in Zetland, on the morning of the 27th of September, 1808. The last specimen was most carefully anatomized by Dr. Fleming of Edinburgh, who was then minister of Bressay, and who afterwards communicated a minute description to the Wernerian Society, which is published in the first volume of the Transactions, p. 131, with three accompanying figures. The animal measured only twelve feet from the snout to the notch which divides the tail. The flippers were fifteen inches in length; the tusk measured only thirty-nine inches; and, as in others, was spirally grooved or twisted, and striated externally from right to left, tapering to a blunt and solid point. The oil yielded by this example was of inferior quality. Dr. Fleming expressed an opinion that there might be two species of Narwhals, viz., the common and the small-headed—referring the example in question to the latter. Respecting the Lincolnshire specimen which was taken at the village of Frieston, near Boston, Sir Joseph Banks, in a letter to Dr. Fleming, observes:—"The animal when found, had buried the whole of its body in the mud of which the beach is there composed, and seemed safely and securely waiting the return of the tide. A fisherman going to his boat saw the horn, which was covered up, and trying to pull it out of the mud, raised the animal, who stirred himself hastily to secure his horn from the attack." Although Sir Joseph Banks communicated similar particulars to

Lacépède, the French naturalist afterwards carelessly stated in his well-known work that the specimen was captured at Boston in America; and Mr. Shaw in his "British Miscellany," actually represented this celebrated Lincolnshire specimen, with two fully developed teeth! Strange errors!

THE NORTHERN BELUGA (*Beluga Catodon*) or White whale, derives its name from the uniformly white colour of the skin. It is an inhabitant of the northern seas generally, being especially numerous off the coast of Greenland, in Hudson's Bay and Davis Strait. The Northern Beluga forms a very striking object, and is remarkable for its elegant symmetry and activity. According to Scoresby it is not at all shy, but often follows ships, herding in numbers to the extent of forty or fifty individuals, which are seen gracefully tumbling above and below the ocean's surface. Two examples have been captured off the British coast. One of these was seen in the Medway as recently as 1846, and it was subsequently shot near Upnor castle. It measured rather more than thirteen feet in length. The other was killed in the Frith of Forth, near Stirling, on the 6th June 1815. A full account of this specimen (fig. 80) is given by Dr. Bar-

clay and Mr. Neil in the third volume of the Wernerian Society's Transactions, and the skin may be seen, beautifully preserved, in the Natural History Museum of the Edinburgh University. On the authority of Mr. Bald of Alloa, Mr. Neill informs us, "that the animal generally passed upwards when the tide was flowing, and returned down the frith with the ebb; this sometimes happened every day, and sometimes once in two or three days; it came frequently to the surface, and was well known for about three months by the name of the white whale. It was supposed to run up the river in pursuit of salmon, and it was at last killed by the salmon-fishers, near the Abbey of Cambuskenneth. The animal had been attacked both with fire-arms and spears," and Dr. Barclay found one of the musket balls in the lungs. It was a male specimen, and measured thirteen feet four inches in length. The flesh of the Beluga is considered good eating by the Greenlanders, whilst the oil is still more highly extolled. Neither the male nor the female exhibit any dorsal fin. The dam usually produces two young at a birth, the suckers having at first a bluish-grey colour. The example shot in the Medway was furnished with thirty-six teeth; twenty in the upper, and sixteen in the lower jaw; but

Fig. 80.

The Northern Beluga (*Beluga Catodon*)

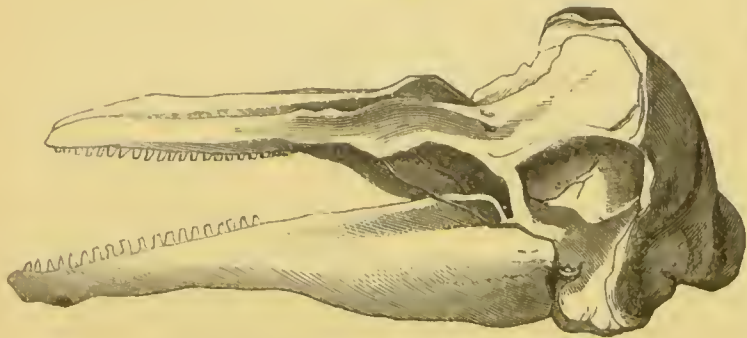
it would seem that the teeth of the upper jaw are deciduous in old individuals. In the Edinburgh specimen there were thirty teeth, eighteen above and twelve below.

THE COMMON PORPOISE (*Phocaena communis*) or PORPESSE, is well known to the inhabitants of the shores of our sea-girt islands. It is the most abundant of all the Cetacea which visit our coasts. The hide exhibits a uniformly deep black colour, except along the central line of the belly where it is whitish. A full-grown Porpoise varies in length from five to eight feet. In dissecting several examples, we have been particularly struck with the immense length of the intestines, and in one example, shot in the Frith of Forth, we found five intestinal cestode worms, four of which measured about ten feet each in length, besides others, parasites in the lungs and liver. These entozoa are described in the 22nd volume of the Linnæan Society's Transac-

tions. Porpoises frequently travel some distance up our rivers, and it is very interesting to watch their playful antics as they tumble to and fro on the light fantastic wave. They visit the Thames nearly every year, and sometimes venture as far as London Bridge. Mr. Bell records an interesting note of their appearance many years ago in the river Warcham, in Dorsetshire. On one occasion, at the close of the year, two that were taken in this river yielded sixteen gallons of oil. "One of them was found to have milk, which some gentlemen tasted, and pronounced to be salt and fishy. About the same season, three years afterwards, three others were driven up the river to the town of Warcham; they were full-grown animals, all about the same size. A fence was put across the river above and below them, in order to retain them for exhibition; but they plunged so violently, and their cries—which they continued during the night as well as the day—were so

distressing, that after the third day of their captivity, they were, like the former ones, taken from the water and cut up." Porpoises sometimes herd in very large numbers, and on these occasions commit terrible havoc amongst shoals of herrings, mackerel, salmon, &c. Our conception of their destructive powers is by no means lessened when we consider the number and form of their teeth (fig. 81); there being usually from ninety to a hundred of these organs, from twenty to twenty-five occurring on either side of each jaw, above

Fig. 81.

Skull of the Porpoise (*Phocæna communis*).

and below. They are somewhat flattened in form, their crowns being also more or less knobbed. The flesh is esteemed a delicacy by the Greenlanders, and also by the inhabitants of our western isles. In the time of Henry VIII. and Elizabeth, it was considered a royal fish, and appeared to be much relished by the courtiers of their day.

THE CAAING WHALE (*Globiocephalus deductor*).—This species is also known as the ROUND-HEADED PORPOISE, BOTTLE-HEAD, SOCIAL WHALE, HOWLING WHALE, BLACK WHALE, and in the catalogue of the British Museum is given as the PILOT WHALE (*G. Scineval*). As the generic name implies, the upper aspect of the head is globular; the species is further distinguished by its long pectoral flippers and black skin, the belly and throat being white along the central line. The jaws are seldom furnished with more than fifty teeth. The Caaing Whales herd in large numbers. Mr. Bell states, that an entire shoal of seven hundred and eighty individuals was once captured at Sumburgh in Zetland; and between the years 1809 and 1810 another shoal came on shore at Hvalfiord in Iceland, consisting of no less than one thousand one hundred and ten examples, all of which were taken. Their appearance off the coasts of Orkney, Zetland, and the Faroe Isles, is by no means infrequent, and they prove a source of wealth to the inhabitants. "On the appearance of a shoal," says Mr. Bell, "the sailors endeavour to get to seaward of their victims, and gradually closing upon them, drive them onwards like a flock of sheep, and urge them by shouts and missiles towards the shore; when one of them, some say a leader, being forced on the beach, a curious scene of self-immolation is acted by the whole herd. They are then attacked by the entire population, who despatch them by various means; and the cries and dying struggles of the poor animals, some in and some out of the water, the shouts and exertions of the men, and the troubled and bloody sea, combine to form a scene of no trifling interest and excitement." Accord-

ing to Dr. Traill, they blindly follow a single leader, which if driven on shore, guarantees the destruction of the entire herd, as their mutual attachment will not allow them to forsake the first victims. Their favourite food appears to be various species of cuttle-fish, though they also take ordinary fish. They yield excellent oil.

THE GRAMPUS (*Grampus orca*) is a large, stoutish-built species of whale, measuring upwards of thirty feet in length, and having a girth of fourteen feet, or more. The anterior part of the head terminates less abruptly than in any of the preceding members of this family, and the animal is further recognized by its pectoral and dorsal fins—the former being broad and rounded, the latter long and elevated. It is an inhabitant of the northern seas generally, and very frequently appears upon our coasts. The largest which has been taken on these shores is that recorded by Lacépède, from notes communicated to him by Sir Joseph Banks. In the words of Mr. Bell, this specimen "occurred in the Thames in 1793. Struck by three harpoons, he rushed off with the boat in which were the persons who had struck him, towed it twice to Greenwich, and once as far as Deptford, against a strong tide running eight miles an hour, notwithstanding the repeated pike wounds which he received whenever he appeared above water. It was killed opposite Greenwich Hospital, and its expiring struggles were so violent that no boat dared to approach it. It was a very large one, being no less than thirty-one feet in length, and twelve in circumference." A specimen taken in Lynn harbour on the 19th November, 1830, weighed three tons and a half. They pretty frequently visit the friths of the Tay and Forth; a large number appeared in the latter bay during July and August, 1793. The Grampus proves very destructive to salmon.

THE COMMON DOLPHIN (*Delphinus Delphis*)—Plate 28, fig. 88—seldom exceeds seven or eight feet in length, though individuals have been occasionally found to measure as much as ten feet. It is readily distinguished from the foregoing species by its almost straight back, and by its attenuated, compressed, and prolonged muzzle, which bears some resemblance to a beak. The jaws are of equal length, and furnished with a very numerous series of teeth, upwards of a hundred and eighty having been counted in some specimens; their form is slender, and slightly curved inwards, and they interlock during the closed state of the jaw. The Dolphin is an inhabitant of the northern seas and the Atlantic Ocean, occasionally making its appearance off our coasts. It is a remarkably active species; and, notwithstanding its voracious and gluttonous habits, was formerly highly esteemed for its flesh. Pennant records, on the authority of the celebrated Dr. Caius, that one which was taken in his time was presented to the Duke of Norfolk, who distributed portions of it amongst his friends. "It was roasted and dressed with porpesse sauce, made of crumbs of fine white bread, mixed with vinegar and sugar." The Common Dolphin feeds principally on fish.

THE BOTTLE-NOSE DOLPHIN (*Delphinus Tursio*) is another North Sea species which has occasionally made its appearance on the British shores. Difficulties exist respecting its identification. It is dis-

tinguished from the common dolphin chiefly by the projection of the lower jaw beyond the upper. There is some reason to believe that the dolphin (*D. truncatus*) described by Mr. G. Montague in the third volume of the Wernerian Society's Transactions, is referable to this species. This specimen was captured off Totness in Devonshire, in the summer of 1814. After the animal had been exhibited, the bones were regarded as rejectamenta, and thrown into the river Dart. Mr. James Cornish, however, subsequently succeeded in recovering the skull, the length of which was twenty inches and a half. "On each side of the upper jaw," says Mr. Montague, "there are sockets for twenty teeth, besides a long depression behind the posterior socket." The under jaw was somewhat longer, and contained twenty-three sockets on either side. Such of the teeth as were discovered were for the most part worn and flat on their crowns. The others, it seems, were knocked out, and freely distributed amongst the curiosity-loving people of Totness!

SOWERBY'S DOLPHIN (*Diodon Sowerbei*), of which only a single example has yet appeared, is characterized chiefly by the possession of a single pair of teeth, occupying the lower jaw. It was cast ashore near Brodie House, Elginshire, and is thus described by Mr. Sowerby, in the first volume of his well-known "British Miscellany":—"The animal is oblong; black above, nearly white below; sixteen feet long, eleven in circumference at the thickest part, with one fin on the back; head acuminate; lower jaw blunt, longer than the upper, with two short lateral bony teeth; upper jaw sharp, let into the lower one by two lateral impressions corresponding with the teeth; opening of the mouth, one foot six inches. Under the throat are found two diverging furrows, terminating below the eyes, which are small, and placed six inches behind the mouth. Spiracles lunate, the ends pointing forwards." The specimen was a male.

Amongst the many other numerous and interesting members of the present family known to exist, we can only particularize the following:—

PERON'S DOLPHIN (*Delphinapterus Peronii*), RIGHT-WHALE PORPOISE, or WHITE-BEAKED DOLPHIN. This species is found on the southern side of the equator, off and between the opposite coasts of Africa and Brazil. It is gregarious in its habits, and readily distinguished by the lustrous white beak, abdomen, and pectoral fins, the other parts being quite black. The head is pointed and slightly convex; the jaws, in different examples, are furnished with from thirty-eight to forty-two on each side, above and below.

THE INIA (*Inia Geoffroyii*), or BOLIVIAN DOLPHIN, is a very singular animal, having the breathing aperture placed far backward on a line with the pectoral fins. The dorsal fin is small. The lips are deeply cleft to beneath the eye; the auditory meatus being likewise unusually large. Mr. Blyth observes that the species is also remarkable as "occurring thousands of miles from the sea, appearing to inhabit only the remote tributaries of the Amazon, and the elevated lakes of Peru. The singular character of possessing bristly hairs on the snout has also been observed in them when very young. This species has large swim-

ming paws, and thirty-four teeth on each side, above and below, all of them rough, marked with deep and interrupted furrows, and of an irregular, mammillary shape behind, which is very peculiar. A female specimen measured seven feet long, and the males are stated to be double that size; colour variable, commonly pale blue above, passing into a roseate hue beneath. It comes more frequently to the surface than the marine species, and is generally met with in troops of three or four individuals."

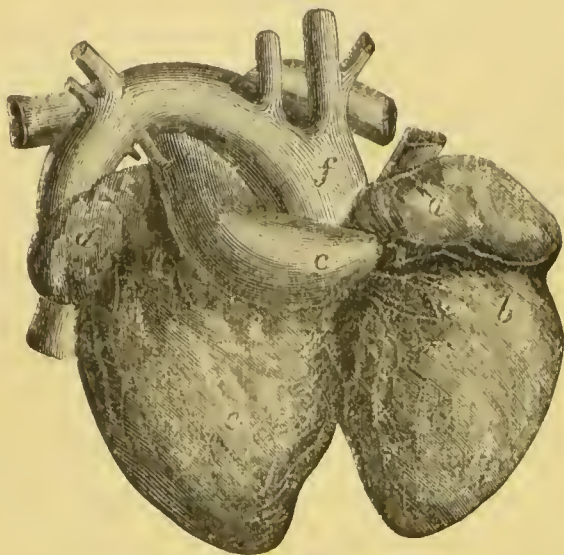
THE SOU-SOU (*Platanista Gangetica*) or Dolphin of the Ganges, is another cetacean of considerable interest, frequenting the mouths, and ascending sometimes high up the rivers. It is readily distinguished by its elongated and laterally compressed snout, swollen at the extremity from enlargement of the jaws, which latter support in front numerous long, conical teeth; there being thirty of these organs on each side, above and below. The breathing opening has the form of a longitudinal fissure, whilst the upper borders of the maxillary bones are prolonged upwards in a singular manner. The eyes are very small, and at first sight scarcely discernible. The pectoral flippers are subtriangular, the dorsal fin being placed far back. The Sou-Sou attains a length of seven feet. It was originally described by Pliny, under the generic title here employed.

FAMILY IV.—MANATIDÆ.

It is a matter of opinion whether it be more correct to associate this family with the present order, or with the Pachydermata; for whilst its members appear, by external characters and habits, more intimately allied with the Cetacea, their internal structure, on the other hand, plainly demonstrates a close alliance with the latter group. Some have suggested, not without reason, that they might almost be treated as a separate order; but, all things considered, it is perhaps better, and certainly more convenient, to adopt our present allocation. All the members of this family are vegetable feeders, and, in consequence, most commonly styled Herbivorous or Phytophagous cetacea. In conformity with their algous diet, we find the teeth modified so as to secure due mastication of the coarse fuci, the molars, when present, being more or less flattened on the crown. The intestinal canal attains a prodigious length, and in the Rytina is said to measure upwards of twenty times the entire length of the animal. The stomach is constricted near the centre, and more or less complicated by cœca and folioles in the different species. The skin is rather hairy, and the face furnished with bristle-like whiskers; but the tail is flattened out transversely as in ordinary cetaceans—a circumstance very strongly insisted on by those who, with ourselves, prefer to retain these animals in the present order. The limbs or paddles are furnished with claws; but there is no trace of posterior extremities. The nostrils are quite separate, placed in front of the abrupt snout, opening near the upper lip. The front of the jaws is covered with horny plates. The mammæ are two in number, and situated below the thorax; and there are from fifteen to nineteen pairs

of ribs. One of the most interesting visceral modifications is that of the heart (fig. 82), which may be said to have two apices, seeing that the ventricles are partially separated from one another, and independent at their lower ends. In the annexed cut the letters of reference indicate as follows:—*a*, right auricle, *b* right ventricle, *c*, pulmonary artery, *d*, left auricle, *e*, left ventricle, *f*, the aorta. In most particulars the skeleton strictly conforms to the cetacean type; but in the head and neck we notice several departures, the cervical

Fig. 82

Heart of the Dugong (*Halicore Dugong*).

vertebræ remaining quite distinct, whilst the head is shortened and comparatively massive in some species. In the Dugong—Plate 34, fig. 139—the intermaxillary bones are enormously developed for the implantation of its incisive tusks, whilst the lower jaw is remarkably broad and deep. These cranial peculiarities are not present in other allied genera. The several bony elements of the fore-limbs are more perfectly formed than in the zoophagous cetaceans, the would-be position of the hinder extremities being indicated by an attenuated V-shaped bone, constituting a rudimentary pelvis. True V-shaped bones also exist along the hoemal aspect of the caudal vertebræ. In conclusion, we have only to observe that all the Manatidæ are found near the sea-coast, and near estuaries and mouths of rivers, up which they occasionally wander to a considerable distance, feeding on marine fuci and other kinds of aquatic vegetation.

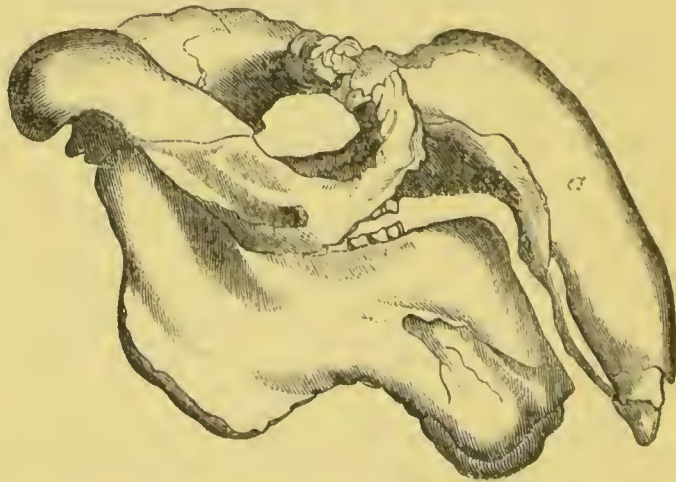
THE MANATEE (*Manatus australis*)—Plate 36, fig. 84—is an inhabitant of the shores and great open rivers of the South American continent, being particularly abundant off the coasts of Guyana and Brazil, where it is commonly known as the Sea-cow. The term Lamantin is sometimes applied to it as well as to another species. The Manatees are gregarious in their habits, and like other Cetacea are devotedly attached to their young, which they defend with great vigour. In the adult state the skin presents a greyish-black colour, whilst, in common with other species of the same genus, the flippers are each provided with four flattish nails, that of the thumb being wanting. They have thirty-two molar teeth, that is, eight on either side above and below, their crowns being irregularly flat, square-shaped, and divided transversely by

a central groove. There are no canines or incisors except in extremely young individuals. Under ordinary circumstances the habits of the Manatee are mild and inoffensive. It is readily taken with the harpoon, and is chiefly valued on account of its flesh, which is stated to be excellent eating. Though formerly very plentiful, the Sea-cow hunters have greatly reduced their numbers. When these animals raise the anterior half of the body out of the water, they display a fanciful resemblance to a human figure, and this circumstance induced our ancient navigators to believe in the existence of sirens, mermen, and mermaids.

Two other species of the genus *Manatus* are also known—the Lamantin, properly so called (*M. Senegalensis* of Adanson), which is a native of the western coasts of tropical Africa, and the Mexican Sea-cow (*M. latirostris*), a very large species, upwards of fifteen feet in length, found on the shores of Florida, Mexico, Surinam, and some of the West Indian islands.

THE INDIAN DUGONG (*Halicore Dugong*)—Plate 26, fig. 85—is a species of very considerable interest, though much smaller than the foregoing, seldom measuring more than seven or eight feet from the tip of the abrupt and flattened snout to the end of the broad crescentic tail. On turning to the drawing given at Plate 26, fig. 85, it will be seen that the flippers are not furnished with nails, but their margins are thickened and tuberculated. One of the most characteristic features of this animal arises out of the presence of two large incisors or tusks in the upper jaw, *a* (fig. 83), the molars being flat, and varying numerically from eight or ten to twenty, according to age and other circumstances. “In the female Dugong,” says Professor Owen, “the growth of the permanent incisive tusks of the upper jaw is arrested before they cut the gum, and they remain through life concealed in the premaxillaries. The tusk is solid, is about an inch shorter, and less bent than that of the male; it is also irregularly cylindrical, longitudinally

Fig. 83.

Skull of the Indian Dugong (*Halicore Dugong*).

indented, and it gradually diminishes to an obtuse rugged point. The base is suddenly expanded, bent obliquely outwards, and presents a shallow excavation.” Speaking of other peculiarities, the same authority also observes that the external form of the Dugong is “not so well calculated for moving rapidly through the water as that of the dolphin and other carnivorous cetacea, which subsist by a perpetual pur-

suit of living animals. In these the snout is conical and peculiarly elongated, and in some, as in *Delphinus Gangeticus*, the jaws are produced to an extreme length, so as to give them every advantage in seizing their swift and slippery prey; whilst in the herbivorous Dugong the snout is as remarkable for its obtuse, truncate character—a form, however, which is equally advantageous to it, and well adapted to its habits of browsing upon the algæ and fuci which grow upon the submarine rocks of the Indian seas. As, from the fixed nature of the Dugong's food, the motions of the animal during the time of feeding must relate more immediately to the necessity of coming to the surface to respire; its tail, the principal organ of locomotive ascent and descent, is proportionally greater than in the true Cetacea, its breadth being rather more than one-third the length of the whole body." The Dugong enjoys a pretty wide geographical distribution, being found not only in the Indian seas generally, but also in the Red Sea; formerly large numbers inhabited the shores of the Isle of France. According to Sir Stamford Raffles, and others, they usually feed at two, three, or four fathoms' depth of water. They are abundant off the Malayan coast, and especially at the mouth of the Johore river. The native Malays spear them at night-time; their presence being indicated by a snuffing noise. When caught, the tail is raised up out of the water, as the animal is quite powerless in this position. The habits of the Dugong are gregarious, herding, says Leguat, to the extent of three or four hundred individuals at a single spot. Like other cetaceans, they display extraordinary attachment to their young, defending them to the death; on being taken the suckers utter a short and sharp cry. All accounts agree in considering the flesh to be delicate and pleasant eating.

One or two other Dugongs have been described. Rüppell considers the form inhabiting the Red Sea as a separate species; and this opinion is shared by several naturalists. It was called by him *Halicore Tabernaculi*, from a notion that the skin was employed by the Jews in veiling the tabernacle. The Australian Dugong (*H. australis*) is generally admitted to be distinct.

STELLER'S RHYTINA (*Rhytina Stelleri*)—Plate 26, fig. 86—is one of those interesting mammalian forms whose extinction is only of very recent date, yet so complete as to have left scarce a wreck behind. Discovered in 1741, after a few short years it entirely succumbed to

the rapacity of our greedy race, who, without even affording naturalists a fair opportunity of unravelling its curious structure, have swept it from its native shores, and well-nigh obliterated all trace of its existence. It is well for science, that Steller, whose worthy name it bears, was among the number of those unfortunate voyagers who were wrecked on the inhospitable shores of the dreary island where this animal was first discovered; and it is still more fortunate that he left an authentic record of his discovery, which was published subsequent to his death by the Academy of St. Petersburg in 1749, and afterwards at Halle in 1753, in a separate treatise entitled "Ausführliche Beschreibung von sonderbaren Meerthieren." At the time of its discovery on Behring's Island, it does not appear to have been particularly abundant, and since the year 1768 no trace of its presence in a living state has ever been recorded. There can be no doubt, however, that considerable numbers previously existed, and these, it appears, have all fallen a prey to the Aleutian sea-otter hunters, whose exploits have been so graphically described by the Russian explorer Von Kotzebue, and others. Steller's Rhytina attained a length of upwards of twenty-four feet, its greatest circumferential girth being about twenty feet. According to Steller the pectoral flippers contained no digits, which, if correct, is very remarkable; and what is equally singular, there were no teeth either above or below, their absence being amply compensated by the presence of hard undulating lamellæ—partly made up of horny tubes and partly calcareous—which covered the jaws internally, and performed all the necessary functions of bruising, masticating, and detaching the sea-weeds, on which these animals lived. Another peculiarity is mentioned as affecting the skin; the epidermis being fully an inch in thickness, and composed of thick cylindrical fibres, which were curiously folded or fissured, so as to present a very rugged uneven surface; the true dermis remaining comparatively thin. The surface of the hide exhibited a deep brown or purplish-black tint. The head was small when compared with the bulk of the body; the tail, on the contrary, extensively developed and of an oval figure. The stomach is described by Steller as small. In the catalogue of Cetacea, preserved in the British Museum, this species is alluded to under the title of the Morskaia Korova or *Rhytina gigas*. It has also been described under the generic appellations of Stellerus, Manatus, and even Trichechus.

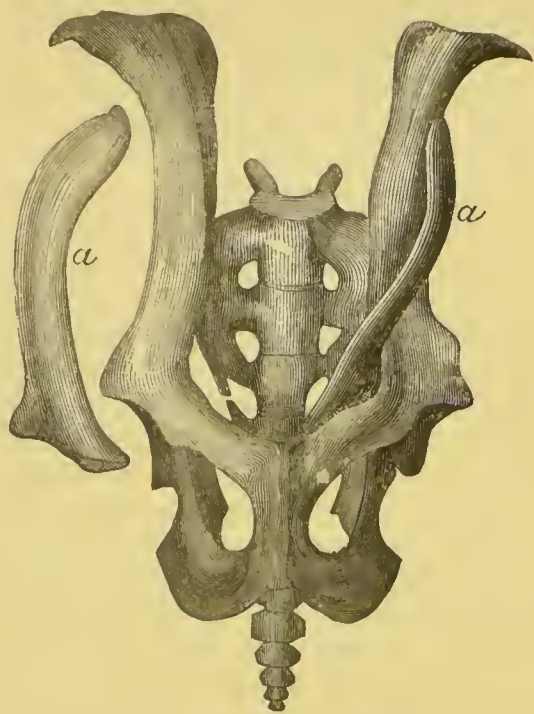
ORDER XIII.—MARSUPIALIA.

As indicated in the general introduction to the class Mammalia, the present order exhibits several characters widely differing from those displayed by any of the foregoing, the distinctive features having especial reference to the parts concerned in the reproduction and the rearing of their young. It is almost superfluous, therefore, to recapitulate the facts—succinctly stated at page 8—which have led naturalists to acquiesce in the arrangement of Cuvier, who first grouped the marsupials

together under the ordinal title above retained; nevertheless it may be well to observe, in brief, that the external and internal characters by which these animals are at once recognized depend upon the presence of abdominal pouches or foldings of the skin, which are inverted in the females for the purpose of concealing, protecting, and nourishing the young, and everted in the males for the lodgment of the reproductive glands. The young are born in an imperfectly developed

state, and transferred by the mother into her marsupium, there to be nurtured through the final stages of their foetal condition, in a manner to be immediately described. Intimately associated with this external specialization of integument, we find the bones of the pelvis, supplemented by two styliform elements, or marsupial trochlear bones, as they are more properly called. Both in the male and female important muscles are attached to these osseous appendages, which are firmly articulated to the anterior border of the pelvis by a broad connecting surface, bound down by interarticular fibrous bands, like those observable in other pelvic synchondroses or ligamentous joints. The marsupial bones vary considerably in different species, being elongated, flattened, and curved in the wombat, and comparatively straight and narrow in *Perameles*. In the koala they are very large and scimitar-shaped, *a* (fig. 84); but only one inch and a half in length in *Myrmecobius*. The ordinary abdominal muscles con-

Fig. 84.

Pelvis and marsupial bones of Koala (*Phascolarctos cinereus*).

needed with these bones aid them in supporting the marsupium and its contents, but a special muscle—analogous to the so-called “cremaster” of the male—is developed in the female, whose function it is to expel the milk-secretion of the mammary glands when the young have become located in the pouch and duly attached to the teats. The mode of their connection with the long nipples is very curious; as, in order to allow of respiratory action being carried on by the foetus in marsupio, it is clearly necessary that the milk should be conveyed directly into the stomach, without the chance of its blocking up the air passages; and as yet—to take an example—the little kangaroo can hardly display any involuntary functions, such as might regulate the flow of milk, and thereby, in connection with the ordinary reflex action of the larynx, obviate the necessity of any special modification of the pharyngeal organs. To prevent choking, therefore, the windpipe is extended upwards to the soft palatal mem-

brane, which, acting like a sphincter, embraces its patent outlet, bringing it into immediate contact, and also in continuation with the nasal passages. At the same time the teat of the mother is thrust far back in the mouth, and the injected milk flows freely down to the stomach, precisely in the same manner as the food of the porpoise, in the first instance, passes the pharynx by two passages into the gullet! One can hardly refrain from comment on so remarkable a modification of structure destined to meet the exigencies of these interesting species; and as, perhaps, our sentiments on this score may derive additional cogency when expressed in the language of an authority—who has contributed more than any other individual to the unravelling of the intricacies and significance of the marsupial structure—we have little hesitation in inviting attention to Professor Owen’s comment, including additional details respecting this organization, as it occurs in the kangaroo:—“Thus aided and protected by modifications of structure, both in the system of the mother and its own, designed with especial reference to each others’ peculiar condition, and affording, therefore, *the most irrefragable evidence of creative foresight*, the small offspring of the kangaroo continues to increase, from sustenance exclusively derived from the mother, for a period of about eight months. During this period the hind legs and tail assume a great part of their adult proportions; the muzzle elongates; the external ears and eyelids are completed; the hair begins to be developed at about the sixth month. At the eighth month the young kangaroo may be seen frequently to protrude its head from the mouth of the pouch, and to crop the grass at the same time that the mother is browsing. Having thus acquired additional strength, it quits the pouch, and hops at first with a feeble and vacillating gait, but continues to return to the pouch for occasional shelter and supplies of food till it has attained the weight of ten pounds. After this it will occasionally insert its head for the purpose of sucking, notwithstanding another foetus may have been deposited in the pouch; for the latter attaches itself to a different nipple from the one which had been previously in use.” Having advanced thus much concerning the most important features of the order, it only remains for us to notice very briefly some other minor characteristics. Speaking generally, it may be said that the numerous species which are thus linked together into one group, present very striking differences in their structure, and consequently also in their habits of living. These are for the most part indicated in the union of the skull and in the form of the teeth, of the two clavicles into a single furcular bone, and in the condition of the cranio-dental peculiarities bearing a strict relation to their carnivorous and insectivorous propensities on the one hand, and to the mixed nature of their food and purely phytivorous habits on the other. In this respect alone, therefore, three or four, more or less, natural groups are presented to us. But it is not alone in the skeleton that such correlative peculiarities exist, as many scarcely less interesting deviations affect the brain, the circulatory organs, the digestive organs, and its associated chylipoietic viscera. Into these, however, it is not our province to enter; and it must, therefore, suffice us to

observe in conclusion, that the varied members of this order are for the most part met with on the great Australian continent and its adjacent islands. Some few inhabit the warmer regions of America, and, what is still more interesting, fossil remains of others have been found in Europe, in the tertiary gypsum beds of Paris, and in the Stonesfield slate of the great oolite formation in England.

FAMILY I.—PHASCOLOMYDÆ.

This family is probably represented by a single living species only, but the fossil genus, *Diprotodon*, established by Professor Owen, is also included in it, or in his rhizophagous tribe of marsupials, which is the same thing. This small group is characterized by the possession of two incisor teeth in either jaw, above and below; there are no canines, and a large interspace separates the incisives from the molars, which are twenty in number, the anterior four being spurious; they have indistinct roots and flattened crowns. All the feet are pentadactylous, but the thumb of the hind feet is rudimentary and clawless. The tail is extremely short. The stomach is provided with a special gland; the cœcum being small, broad, and furnished with a vermiform appendage.

THE WOMBAT (*Phascolomys Wombat*)—Plate 28, fig. 93—is a short thick-set animal, from two to three feet in length, and weighing about thirty pounds. The head is large, and furnished with small ears, the tail measuring only half an inch. In the skeleton, however—if three of the outer-iliac vertebral segments be reckoned as belonging to the category of sacral elements—there are no less than thirteen or fourteen caudal vertebrae. Another peculiarity in the skeleton arises out of the presence of fifteen or sixteen pairs of ribs—a number considerably exceeding that of other marsupials. The fur is thick, and of a sandy brown colour below and at the sides, being darker along the line of the back. The eyes are small, and not at all prominent. One of the best accounts of the Wombat's habits is that furnished by Colonel Collins at the early part of the present century. "This animal," he says, possesses no claim to swiftness, as most men could run it down. Its pace is hobbling or shuffling, something like the awkward gait of a bear. In disposition it is mild and gentle, as becomes a grass-cater; but it bites hard and is furious when provoked." His friend, Mr. Bass, he adds, "never heard its voice but at that time.

It was a low cry between a hissing and a whizzing, which could not be heard at a distance of more than thirty or forty yards. He chased one, and with his hands suddenly lifted it off the ground without hurting it, and laid it upon its back along his arm like a child. It made no noise nor any effort to escape, not even a struggle." Subsequently, however, the little animal shrieked and made its escape, whilst Mr. Bass was preparing to tie it up. Colonel Collins further on observes, that besides living in Furneaux's island, the Wombat inhabits the hills to the west of Port-Jackson. "In both these places its habitation is underground,

the animal being admirably formed for burrowing; but to what depth it descends does not seem to be ascertained. According to the account given of it by the natives, the Wombat of the mountains is never seen during the day, but lives retired in its hole, feeding only in the night; that inhabiting the islands is seen to feed all times of the day." Its food consists chiefly of coarse grass and roots. The flesh is said to be delicate and excellent eating. The female produces three or four young at a single birth.

From the examination of a skull brought from South Australia, Professor Owen has expressed his belief in the existence of a second species of Wombat, which he has provisionally named *Phascolomys latifrons*. The fossil genus *Diprotodon* attained gigantic proportions, being nearly as large as the hippopotamus.

FAMILY II.—MACROPIDÆ.

The Kangaroos are readily distinguished by the disproportionate bulk of the hinder parts of the body as compared with those in front, this feature being more particularly noticeable in the development of the tail and hinder extremities. The feet are greatly elongated by an extension of the metatarsal bones and digital phalanges, their soles being applied to the ground during progression. The powerful tail acts as a fifth limb during the slower movements of the body, and forms, in conjunction with the hind legs, a firm tripod basis of support during the state of rest. The fore limbs are short, pentadactylous, attenuated, and furnished with compressed curved claws, the nails of the hind feet being straight and tetradactylous. Speaking generally, the body presents a conical outline, tapering from below upwards. The ears are largely developed and oval in shape; but a more important character is

Fig. 85.



Skull of the Great Kangaroo (*Macropus giganteus*).

seen in the teeth—(fig. 85.) According to Professor Owen, there are in the normal condition of the permanent dental series six superior and two inferior incisors, no canines, four premolars equally divided above and below, and sixteen true molars, that is, four on either side of the upper and lower jaws. In the genus of Kangaroo Rats or Potoroos (*Hypsiprymnus*) canines are present in the upper jaw. In the true Kangaroos the central incisors of the upper are not longer than

the others, the outer pair being at the same time comparatively broad. In the Potoroos the middle incisors are of considerable length. In all the members of this family the head is rather small, and the upper lip is cleft. These animals possess complicated stomachs, and they display great powers of leaping; only using their anterior limbs when feeding. They are found almost exclusively in Australia, some few occurring in New Guinea and Van Diemen's Land.

THE GREAT KANGAROO (*Macropus giganteus*)—Plate 29, fig. 92—is an animal of very considerable interest, not only on account of its amazing powers of leaping and marsupial peculiarities, but on account of the circumstance of its being the largest living and indigenous quadruped inhabiting the great Australian continent. An adult specimen measures upwards of four feet in length, not including the tail, which would give us an additional three feet; its weight occasionally exceeding one hundred and forty pounds. The capture of the Great Kangaroo in its native haunts is attended with great and varied excitement; and when it was discovered by the sailors under Captain Cook, during one of his ever-memorable voyages, they were not slow to extol and exaggerate its leaping propensities. It is now very commonly hunted with dogs; but the natives have a peculiar method of their own. According to Captain Grey, as quoted by Mr. Dallas in his excellent little manual entitled "A Natural History of the Animal Kingdom,"—"the native advances quietly in the direction where he expects to find his game, with every sense on the alert to give him notice of its approach. When the animal is near him he is seen to assume an attitude of intense attention, and, at a given signal, his wives and children, who accompany him, drop immediately upon the ground. When the savage is thus occupied, you will see at about a hundred yards from him, a kangaroo erect upon its hind legs, and supported by its tail. It is reared to its utmost height, so that its head is between five and six feet above the ground, its short paws hang by its side, its ears are pointed—it is listening as carefully as the native, and you see a little head peering out from its pouch to inquire what has alarmed its mother. But the native moves not: you cannot tell whether it is a human being or the charred trunk of a burned tree which is before you, and for several minutes the whole group preserve their relative position. At length the kangaroo becomes reassured, drops upon its fore paws, gives an awkward leap or two, and goes on feeding; the little inhabitant of its pouch stretching its head further out, testing the grass its mother is eating, and evidently debating whether or not it is safe to venture out of its resting-place, and gambol about amongst the green dewy herbage. Meantime the native moves not until the kangaroo, having two or three times resumed the attitude of listening, and having like a monkey scratched its side with its fore paw, at length once more abandons itself in perfect security to its feeding, and playfully smells and rubs its little one. Now the watchful savage, keeping his body unmoved, fixes the spear first in the throwing stick, and then raises his arms in the attitude of throwing, from which they are never again moved until the

kangaroo dies or runs away. His spear being properly secured, he advances slowly and stealthily, no part moving but his legs. Whenever the kangaroo looks round, he stands motionless in the position he is in when it first raises its head, until the animal, again assured of its safety, gives a skip or two, and goes on feeding. Again the native advances, and this scene is repeated many times, until the whistling spear penetrates the devoted animal." The Great Kangaroo and others of its kindred, breed freely in this country, many British-born individuals existing in the Zoological Society's Gardens and in private collections. The flesh is said to be good eating, and not unlike venison in flavour.

The so-called SOOTY KANGAROO (*Macropus fuliginosus* of Desmarest), as well as two other large species described by Mr. Gould in his attractive folio "Monograph on Kangaroos," as *M. ocydromus* and *M. melanops*, are, in Mr. Waterhouse's view, only probable varieties of the Great Kangaroo. Very many other species, however, are known to exist, of which we can only specify the following:—The RED KANGAROO (*M. laniger* of Gould) is a large species occupying the interior of the Australian continent, and frequenting the banks of the river Darling and the Murrumbidgee. The GREAT ROCK KANGAROO (*M. robustus* of Waterhouse), or Black Wallaroo of the natives, is found in hilly localities. The female has a silvery or grey colour, and is much less than the male; the fur of the latter exhibiting a rich black tint. Amongst the smaller species may be mentioned the BLACK-GLOVED KANGAROO (*M. Irma*), which is about thirty inches in length and found in Western Australia. Desmarest's RED-NECKED KANGAROO (*M. ruficollis*), a species well-known in this country, inhabits New South Wales and King's Island. A very tiny species, called the PANDEMELON WALLABY (*M. Thetides*), is only twenty inches long, excluding the tail, and is much sought after for the sake of its flesh. The RED-BELLIED WALLABY (*M. Billardieri*) is a gregarious species, as is also the BRUSH-TAILED ROCK KANGAROO (*M. penicillatus*). LE BRUN'S KANGAROO (*Halmaturus Asiaticus* of Gray) is an inhabitant of New Guinea; it possesses a very long narrow head with shortish ears, the fore-legs being comparatively strong. The fur exhibits a greyish colour generally, more or less tinged with yellow, especially underneath. Respecting the small HARE KANGAROO (*Lagorchestes leporides*), Mr. Gould records the following amusing little incident:—"While out on the plains," he says, "I started a hare kangaroo before two fleet dogs; after running to the distance of a quarter of a mile, it suddenly doubled and came back upon me, the dogs following at its heels. I stood perfectly still, and the animal had arrived within twenty feet before it observed me, when, to my astonishment, instead of branching off to the right or the left, it bounded clear over my head, and on descending to the ground I was enabled to make a successful shot, by which it was procured." Mr. Gould specifically distinguishes several other closely allied forms, and gives beautiful figures of them in his large work.

In the Tree-Kangaroos the anterior and posterior limbs have nearly the same length, whilst the tail is

longer than the body. The strongly-curved and powerful claws are also rendered subservient to their arboreal climbing habits. Two species have been described by M. Salomon Müller, which he respectively denominates

Fig. 86.

The Tree-Kangaroo (*Dendrologus inustus*).

Dendrologus ursinus and *D. inustus*—Fig. 86. Both have moderately well developed ears, whilst the two superior central incisor teeth are scarcely longer than the outer pair.

THE POTOROO (*Hypsiprymnus minor*), or KANGAROO RAT—Plate 29, fig. 91—is a gentle, timid, little animal, about the size of our common rabbit. It is a native of New South Wales, and tolerably abundant in the neighbourhood of the river Weragambia. The fur exhibits a greyish-brown colour generally, being reddish above and white underneath the belly. The ears are of large size; the tail being also conspicuously developed; more uniform in thickness than obtains in kangaroos proper, very flexible, and slightly tufted at the extremity. The fore-limbs still display much disparity when compared with the stout posterior pair; the same relation holds good in regard to the feet, the three central claws of the pentadactylous fore-feet being strikingly developed. The muzzle is so considerably attenuated and produced, that in the skull the nasals are seen to extend beyond the level of the upper jaw. This animal is further distinguished by the remarkable length of its anterior grinding teeth, or premolars, which are also

sculptured by vertical grooves externally; these dental characteristics are also present in congeneric forms, several of which have been described as distinct species by Ogilby, Gould, and others.

FAMILY III.—PHALANGISTIDÆ.

The marsupials associated under this head are commonly called Phalangiers, and although only some of them exhibit highly exalted leaping powers—in virtue of assistance derived from a membranous expansion of the skin at the sides of the body—yet, on the whole, they form a tolerably distinct group. Among the more distinguishing peculiarities are those which have reference to their partially carnivorous diet and arboreal habits. The disparity between the hind and fore legs no longer exists, whilst the posterior feet have become pentadactylous, the thumb remaining unarmed, and the second and third toes conjoined as far forward as the base of the claws. The teeth vary considerably in different genera; thus, in the true Phalangiers there are only eight incisors, disposed as in the kangaroos, and sixteen constant true molars—although occasionally we

find also two or four canines. In all cases the upper central incisors are comparatively large, the lower being conspicuous and procumbent as in the Kangaroos. In the Pigmy Petaurist, or Flying Phalanger, there are twenty-four permanent molars in addition to the four canines, whilst other members of the genus *Petaurus* display twenty-eight molars, the anterior twelve coming under the category of spurious grinders. In the genus *Phascogale*, on the other hand, there are only two canines occupying the upper jaw, and twenty molars, the anterior four being false. All the Phalangists are provided with a simple stomach and a long cæcum. In most cases the tail is extensively developed, but in the aberrant genus *Phascogale* it is merely rudimentary. In some, the tails are prehensile. The habits of the family are arboreal and nocturnal; they feed partly upon fruits and leaves, and on small birds.

THE VULPINE OPOSSUM (*Phalangista vulpina*) is a very common species in Australia, and is much hunted by the natives, who are particularly fond of its flesh. It is called in their strange language the *Wha-tapooroo*. Although somewhat fox-like in appearance, it is a much smaller animal, measuring about twenty-six inches in length, exclusive of the tail, which would give us some additional fifteen inches. The fur exhibits a ruddy buff colour generally, inclining to a ferruginous tint at the lower part of the throat; the tail is black, except at the root. The ears are about one inch and a half long; the limbs being also comparatively short. Similar characters likewise exist in another form inhabiting Van Diemen's Land; this is a larger and darker coloured animal, being considered by Messrs. Gould and Ogilby to be distinct; they have accordingly imparted to it the combined generic and specific title *P. fuliginosa*.

THE SPOTTED PHALANGER (*Cuscus maculata*), or SCHAM-SCHAM, has been generically separated by Lacépède and Temminck on what appears to be very satisfactory grounds; for we find no less than twelve incisors, six above and the like number below—the total number of all the teeth together amounting to forty. In this animal the tail is prehensile and naked at the narrowed extremity, where it is also marked with rugosities. The Scham-Scham is an inhabitant of New Guinea and the Moluccas, being also called *Cocococ* by the natives of the latter island—hence the generic title adopted by the French naturalist. The fur has a thick woolly texture, having a whitish ground colour, which is spotted by large, more or less isolated deep brown patches, some of the maculæ occasionally running into one another. The body is stoutish throughout; the ears being remarkably short. It appears to be slothful in its movements; at least such is the character given to it by M. Lesson.

THE MOUSE-LIKE PHALANGER (*Phalangista gliriformis*)—Plate 30, fig. 94—has been elevated by Dr. J. E. Gray into a subgeneric rank, under the title of *Dromicia*, on account of certain dental peculiarities; but, "as these modifications of the teeth are unaccompanied by any change of general structure or of habit, whilst those teeth which most influence the diet are constant, it is obvious," says Professor Owen, "that these differences of dentition are unimportant, and

afford no just grounds for subgeneric distinctions." The particular tooth-characters here adverted to, have reference more particularly to the presence of only three true molars on each side of either jaw; but apart from this feature the Mouse-like Phalanger possesses many points of interest. It is remarkably small, the body measuring only four inches in length, excluding the tail, which would give us upwards of three inches and three quarters more. This organ is black at the root, and clothed with short stoutish hairs, except at the tip, where it is naked. The ears are large and almost destitute of hair. This little marsupial is only found in Van Diemen's Land. Excellent figures of it are given by Waterhouse and Gould, and by Mr. Bell in the sixteenth volume of the Linnean Society's Transactions.

THE SCIURINE PETAURIST (*Petaurus sciureus*), or SUGAR SQUIRREL.—The distinguished naturalist Shaw separated the flying Phalangists into a distinct genus—*Petaurus*—on account of the peculiar membranous expansion of the skin existing between the anterior and posterior limbs, associated with a non-prehensile hairy tail. Five or six species have been described. These are—*P. taguanoides*, the largest, with a brown fur, whitish-grey underneath, and hairy ears (fig. 87); *P. Australis*, or the Hoppona-Roo, with long and naked ears, the fur being fulvous below and marked by dark-coloured bands along the central line of the back; *P. breviceps*, *P. sciureus*, *P. Ariel*, *P. breviceps*, and *P. pygmaeus*. As has been already indicated, the last-named species presents some trifling departure from the other Petaurists as regards the teeth, which led Desmarest to give it the generic title of *Acrobates*. Respecting the habits of the Sugar Squirrel—which are very similar in all the species—Mr. Bennett has supplied the following interesting account—"During the day the animal generally remains quietly nestled in the hollows of trees, but becomes animated as night advances, and skims through the air supported by its lateral expansions, half leaping, half flying from branch to branch, feeding upon leaves and insects. This peculiar mode of locomotion can scarcely be considered a true flight, inasmuch as the cutaneous folds, which serve the purposes of wings, seem rather destined for the mere support of the animal in its long and apparently desperate leaps, than for raising it in the air, and directing its course towards any given object. For this latter purpose they are indeed but little fitted by their structure, the want of proper muscles in a great measure incapacitating them from performing such offices as are dependent on volition. It may be doubted, however, whether these animals are entirely destitute of the power of exercising their will in their flight-like leaps. For the following anecdote bearing upon this subject, we are indebted to our friend Mr. Broderip, who related it to us on unquestionable authority—"On board a vessel sailing off the coast of New Holland was a squirrel—*Petaurus*—which was permitted to roam about the ship. On one occasion it reached the mast-head, and, as the sailor who was despatched to bring it down approached, made a spring from aloft to avoid him. At this moment the ship gave a heavy lurch, which, if the original

direction of the little creature's course had been continued, must have plunged it into the sea. All who witnessed the scene were in pain for its safety; but it

suddenly appeared to check itself and so to modify its career that it alighted safely on the deck.' " All the species are natives of New South Wales. The Seiurine

Fig. 87.

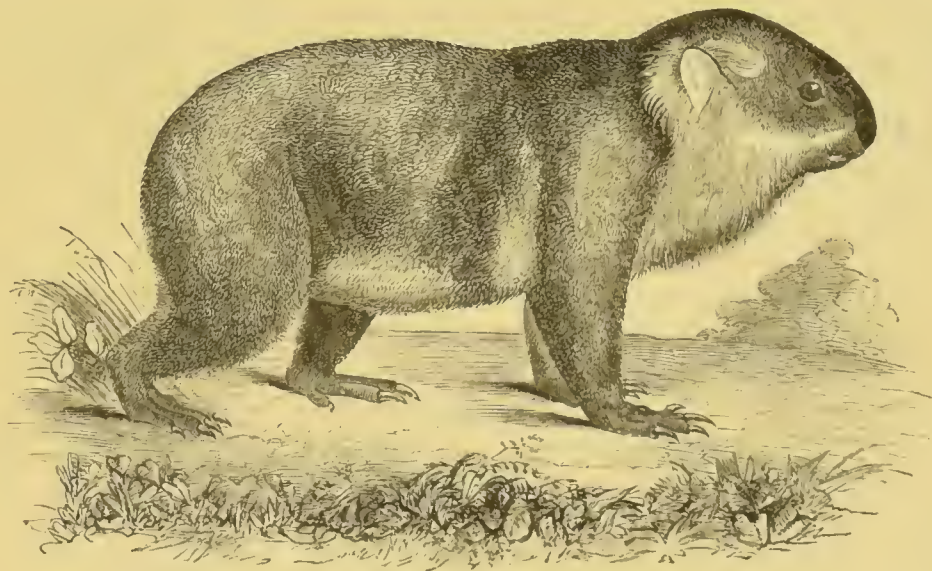
The large Petaurist, or Flying Squirrel (*Petaurus taguanoides*).

Petaurist is also found in New Guinea and its adjacent islands. It is sometimes called the Norfolk Island Flying Squirrel, having been originally described as inhabiting the outlying and isolated spot of land which bears that name. The fur is ash-coloured above and whitish underneath. A brownish line extends from the muzzle to the root of the tail, the latter organ

being tufted and black at the tip. In the little mouse-like Pigmy Petaurist the hairs of the tail are regularly disposed in two rows, one on either side, like the barbs of a feather.

THE KOALA (*Phascolarctos cinereus*).—Although this animal has been generically separated from the Petaurists and true Phalangers, yet there is no reason to

Fig. 88.

The Koala (*Phascolarctos cinereus*.)

place it outside the family limits of Phalangistidæ. The most striking differences have reference to the thick-set body, and more particularly to the extreme shortness and rudimentary condition of the tail (fig. 88). Its dentition for the most part corresponds with those of the Phalangers; but it never displays canines in the lower

jaw, and is only furnished with four premolars, one on either side above and below. All the molars are provided with four pyramidal tubercles. To the pentadactylous character of the feet, the very large cæcum, and other essential features of the family, it is entirely conformed. The digits of the anterior feet separate

into two groups, the pollex and index fingers antagonizing the outer three, so as to afford a strong prehensile action. The Koala is a native of various parts of Australia. It is about the size of a small dog, measuring nearly two feet in length. The fur is coarse, thick, and long, possessing a peculiar ashy-brown colour. It is eminently arboreal in its habits, feeding only upon leaves and buds, but partly residing in small burrows excavated beneath the roots of trees. The female is wont to carry her offspring on her back for a considerable period. Its movements, however, are comparatively sluggish under ordinary circumstances.

FAMILY IV.—PERAMELIDÆ.

Looking at the dental peculiarities displayed by the members of this family—commonly called Bandicoot Rats—it will be at once evident that we have passed on to a group of marsupials far less phytivorous in their habits than any of the preceding. In short, we have taken up a carnivorous type, and find, accordingly, well-developed canines, numerous incisors—ten above and six below—and, in addition, there is a full complement of molars—twelve false and sixteen true; but the characters of the latter conform more closely to the insectivorous than to the carnivorous mammals, properly so called. Co-ordinating with the multiple arrangement of the teeth, we find a marked extension of the jaws, combined with a corresponding attenuation of the muzzle. The hind feet are much longer and stouter than the anterior pair, whereby their leaping powers are increased, the second and third toes of the posterior limbs being also conjoined as far as the base of the claws, whilst the digit equivalent to the thumb is perfectly developed in the fore-feet. The outer toes are very short and placed far back—almost concealed. The other toes are all furnished with powerful claws, enabling their possessors to dig and burrow with facility. Bandicoots are found only in Australia and Van Diemen's Land.

THE LONG-NOSED BANDICOOT (*Perameles nasutus*).

—Four or five species are referable to the present genus; for in addition to the one here named, naturalists have recognized *P. Lagotis*, *P. Gunnii*, and *P. obesula* as specifically distinct. The first of these three had been generically separated by Professor Owen, under the title of *Thalacniss*. It is also commonly known as the Philander, and is furnished with long ears and an extensive bushy tail; the muzzle being very much produced and abruptly attenuated. The outer incisor of the upper is not separated widely from its fellows. *P. Gunnii* of Dr. J. E. Gray is an inhabitant of Van Diemen's Land, and is distinguished by its possession of a very short, white tail; the haunches being also marked by several pale-coloured bands. In addition to insects, it appears to be very fond of bulbous roots. *P. obesula* is commonly termed the Spring Bandicoot—Plate 30, fig. 95. In the Long-Nosed Bandicoot the ears are moderate and pointed, the fur having a brownish-grey tint above, passing into white beneath; the nose is prolonged beyond the jaw. In all, the cæcum is of moderate size. According to Professor Owen, the marsupial pouch, “at least in the full-grown

females of *P. nasuta*, *P. obesula*, and *P. Lagotis*, has its orifice directed downwards or towards the cloaca, contrariwise to its ordinary position in the marsupials; this direction of the pouch evidently relates to the proeminent position of the trunk when supported on the short fore and long hind legs.” During progression, the Bandicoots move the hind-feet together alternately with the fore-feet, after the saltatory manner of rabbits. Their flesh is said to be good eating.

OGILBY'S BANDICOOT (*Charopus castanotis*), or the PIG-FOOTED BANDICOOT, is a remarkable species, apparently possessing only two toes on the fore-feet; the pollex of the hinder feet is also absent, the outer pair of digits being very conspicuously developed. The claws of the latter, as well as of the didactyle fore-feet, are particularly strong and adapted for burrowing. This species carries forty-six teeth—eight incisors above and six below, four canines, twelve spurious, and sixteen true molars. The ears are long, elliptical, and nearly naked; but the tail is altogether wanting.

Another aberrant form of Bandicoot has been described by Gervais, and subsequently by Waterhouse and Gould, under the title of *Tarsipes rostratus*. It is a native of Western Australia, arboreal and insectivorous in its habits, furnished with moderate ears, pentadactylous feet—the thumb of the hinder pair being clawless—and a long prehensile tail. It possesses only two proeminent incisors in the lower jaw, four canines, and a variable number of molars, only twelve remaining constant. This anomalous species has no cæcum.

FAMILY V.—DASYURIDÆ.

The Dasyures constitute a highly carnivorous group of marsupials, clearly representing the true Carnivora of the placental mammals. The typical forms have eight incisors above and six below, four well-developed canines, eight pre-molars, and sixteen true molars—in all, forty-two teeth. According to Professor Owen, “the spurious molars have a pointed, compressed, triangular crown, with a rudimental tubercle at the anterior and posterior part of its base. The grinding surface of the true molars in the upper jaw is triangular; the first presents four sharp cusps; the second and third each five; the fourth, which is the smallest, only three. In the lower jaw the last molar is nearly of equal size with the penultimate one, and is bristled with four cusps, the external one being the longest.” In other respects the lower grinders correspond with those opposed above. The anterior limbs are pentadactylous, but the posterior pair have usually only four digits, the pollex being occasionally represented by a small, clawless, warty tubercle. Some of the species are strong and powerfully-built animals. In all, the tail is moderately long, non-prehensile, and generally hairy throughout. The various species are natives of Australia and Van Diemen's Land.

THE URSINE OPOSSUM (*Dasyurus Ursinus*), or “Native Devil,” as the Tasmanian colonists term it, is a truly formidable species. It is about the size of our common badger, being furnished with a coarse black fur, which is here and there irregularly marked with whitish spots. The tail is rather bare under-

neath. By all accounts these ursine opossums are perfect pests, and prove terribly destructive to poultry, sheep, &c., hardly anything coming amiss to them. According to Mr. Harris, they were extremely numerous when the first attempts were made to settle at Hobart Town; but they appeared to have done good service in affording supplies of fresh food to the convicts sent thither; their flesh is said to eat like veal. As the settlement increased, their numbers diminished, and they were driven into the forest, where they are still pursued and secured by traps. They are extremely rapacious and savage, both in the wild and semi-domesticated state. They utter a hollow barking noise, something like that of a dog; and judging from their resentful persecuting behaviour, appear to have well earned the colonial appellation by which they are so significantly characterized.

Several other species are known to exist; and of these we may mention—The Longtailed Dasyure (*D. macrourus*), having a rudimentary hallucinar wart, by

which it is distinguished from the two following—Mangé's (*D. Mangii*), a smaller species of an olive ground colour; and Shaw's Dasyure (*D. viverrinus*), or Wild Cat of the Tasmanians—Plate 31, fig. 97—which has a black fur. All three are marked by large white spots on the body, and in the two first the tail is similarly distinguished.

THE THYLACINE (*Thylacinus Harrisii*) is a native of Van Diemen's Land, and is variously termed by the colonists "pouched wolf," hyæna, tiger, zebra, opossum, and so forth. It enjoys the distinction of being the largest of all the carnivorous marsupials, and is about the size of an ordinary fox-hound, but stouter built, and standing lower on the legs. The fur exhibits a dusky brown color, the erupper being barred transversely by sixteen deep black bands running parallel from side to side (fig. 89). The Thylacines are highly carnivorous, and prove terribly destructive to the flocks of sheep, which they seem to prefer to any other kind of animal food, though formerly they must have sub-

Fig. 89.

The Pouched Wolf or Thylacine (*Thylacinus Harrisii*).

sisted, almost entirely, on phalangiers and kangaroos. They are seldom captured alive, and appear to be very wary animals. The Thylacine is nocturnal in its habits. It is furnished with forty-six teeth; but the circumstances most worthy of note are seen in the strongly carnassial character of the molar teeth, and in the great size of the canines, as compared with other non-placental mammals. No other living species exists; but a fossil Thylacine has been discovered in the tertiary gypsum beds of Paris—a fact of extreme interest, taken in connection with other extinct marsupial remains elsewhere found in Europe, and demonstrating the wide geographical distribution these creatures maintained in former times.

THE COMMON PHASCOGALE (*Phascogale penicillatus*).—The present genus embraces three or four

very small marsupials, whose dental formula is precisely the same as that of *Thylacinus*; whilst the only differences appertain to the less carnassial character of the molars—serving to approximate them more closely to the insectivorous type—and to an elongation of the central incisives, which is more particularly manifest in the upper series. All the species are remarkably minute; one of them—the *Antechinus minutissimus* of Gould—being the smallest living marsupial, and measuring less than two inches and a half long, exclusive of the tail. In many particulars these animals resemble the entomophagous opossums. The common *Phascogale* is about the size of our common rat. The fur is short, thick, and woolly, and of a uniform ashy color above, passing into white beneath. The tail is well developed, and very bushy towards the tip. Its

habits are arboreo-nocturnal, and in common with its congeners it preys chiefly on insects and small birds. This species is a native of Australia generally, but has not, we believe, been found in Van Diemen's Land.

THE BANDED MYRMECOBE (*Myrmecobius fasciatus*) is an inhabitant of South-western Australia, having been originally discovered and procured by Lieutenant

Dale, at about ninety miles to the south-east of the mouth of the Swan River. The Myrmecobe (fig. 90) is at once distinguished from its insectivorous congeners, and also from all other marsupials, by the large number of teeth, of which there are fourteen incisors—eight above and six below—four canines, twelve pre-molars, and no less than twenty-four true molars; in

Fig. 90.

The Banded Myrmecobe (*Myrmecobius fasciatus*).

all, fifty-four. The dental formula thus approaches very closely to that of the extinct—and probably marsupial—genus *Thylacotherium*. Professor Owen also observes, that it is to a certain extent comparable to the dentition of the armadillos “in the small size of the molar teeth, their separation from each other by slight interspaces, and their implantation in sockets, which are not formed upon a well-developed ridge or process. The molars, however, present a distinct multicuspidate structure, and both the true and false ones possess two separate fangs as in other marsupials.” There does not appear to be any necessity to consider this animal as the type of a distinct family. It is about the size of a rat, measuring ten inches from the nose to the root of the tail. The fur exhibits a rufous ground tint generally, the feet being more decidedly red, the back dark brown and banded over the crupper by whitish hairs, similar to those of the thylacine. The head displays a sharply-acuminated muzzle and short pointed ears. The tail is seven inches long and bushy, the anterior feet pentadactylous, and the hind pair four-toed, all the digits being armed with strong, compressed, curved claws. Its habits are arboreal, and it burrows under the roots of trees in search of insects.

FAMILY VI.—DIDELPHIDÆ.

Under this head are collected together all the American marsupials or opossums, properly so called. The species are extremely numerous, for the most part confined to Brazil and the neighbouring provinces of Guyana, Paraguay, and Peru; a few being found in Mexico and California, and one in the United States.

A single species only occurs in Chili. The opossums are comparatively small, seldom exceeding the size of our domestic cat; the jaws are furnished with eighteen incisors—ten above and eight below—four canines, and twenty-eight molars, the anterior twelve being spurious (fig. 91). The head is pointed, the ears large

Fig. 91.

Skull of the Virginian Opossum (*Didelphis Virginiana*).

and naked, the gape of the mouth very wide, the produced muzzle being furnished with a few long bristles. The tail is prehensile, more or less semi-nude or scaly. The feet are all pentadactylous, but the pollex of the hinder pair is opposable to the other digits, and clawless. The opossums are arboreal and nocturnal in their habits, preying chiefly upon birds, eggs, insects, and even fruit. Their movements, however, are rather sluggish than otherwise, and their presence is recognizable by the peculiar fetid odour of their skin. They have a simple stomach and moderately capacious cecum.

THE VIRGINIAN OPOSSUM (*Didelphis Virginiana*), or COMMON POSSUM—Plate 30, fig. 96—enjoys the distinction of being the first known to naturalists. It

is widely distributed throughout the United States, and is especially abundant towards the south. A full-grown specimen measures twenty inches in length, exclusive of the tail, for which other fourteen inches must be allowed. The fur has a dusky-brown colour, the individual hairs being whitish, with brown tips. The legs are nearly black, the digits being lighter coloured or whitish. The head is fulvous-white, with a dusky suffusion round the eye; the ears are black, with a yellow patch at the upper border; the root of the tail is also dark coloured. The Possum is very destructive to poultry, and proves a troublesome pest. The female produces sometimes as many as sixteen young at a birth, which, when at first transferred to the marsupial pouch, are extremely minute. The eyes of the young open about the fiftieth day, when the cubs are as large as ordinary mice. The flesh is said to be good eating.

Among the more interesting or noticeable of the other species, we may mention the following:—The TEXAS POSSUM (*Didelphis Californica*), which is distinguished by its smaller size, its less rounded and more pointed ears; the hairy or basal portion of the tail being also shorter. According to Mr. J. H. Clarke of the United States expedition, this species is particularly fond of the black persimmon, an abundant fruit

on the borders of the Rio Grande. The *D. Murina* is found in Mexico, Guyana, Peru, and Brazil; the *D. dorsigera* in Surinam. "These species," as Van der Hoeven observes, "carry their young on the back when they are sufficiently developed to leave the teat, to which at first they were attached, whilst they throw their tails like tendrils round the caudal appendage of their parent." In both the tail is fully as long as the body, and the ears are largely developed. AZARA'S POSSUM (*D. Azara*) pretty closely resembles the Texas form. According to Mr. Spence F. Baird, it is distinguished by its white head and neck, with a central dark stripe along the forehead to the dusky part of the nape. The ears and toes are flesh-coloured. The CRAB-EATING OPOSSUM (*D. cancrivora*)—so called from its propensity for eating these crustacea—is a large species, possessing no well-defined markings on the head; the generically distinctive, long, and sparsely scattered hairs of the short fur existing more or less abundantly in all the opossums. The fur exhibits a deep black colour.

THE YAPOCK (*Cheironectes variegatus*), or PETITE LOUTRE of Buffon, is an aquatic form of opossum inhabiting the river banks of Brazil and Guyana (fig. 92). The only point in which it appears to differ

Fig. 92.

The Yapoek (*Cheironectes variegatus*)

materially from the ordinary opossums, has reference to the palmated character of the feet, which are supplied with interdigital membranes. In all other particulars it conforms to the genus *Didelphis*. The

Yapoek is little more than a foot in length, exclusive of the tail, which is scaly and prehensile, and nearly as long as the body. It is an expert swimmer, and feeds upon fishes, crustacea, and other aquatic animals.

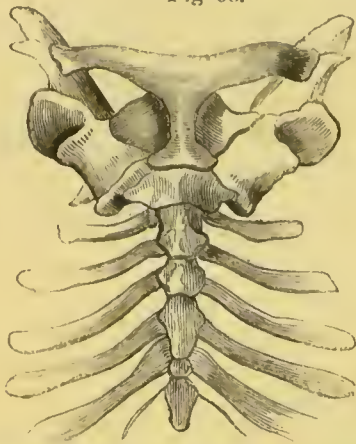
ORDER XIV.—MONOTREMATA.

It is not a little significant of the universality of plan pervading all vertebrate formations, that we should find on examining the skeleton and viscera of the monotremes, a decided approximation to certain of

the distinguishing characteristics of birds and reptiles. At first sight there is little to suggest this relationship, except in so far as the bill-like jaws of *Ornithorynchus* are admitted to resemble a duck's beak; but on closer

examination, several oviparine features will be immediately discovered. M. Geoffroy St. Hilaire first gave the name of Monotremata to the small group of non-placental marsupial mammals here associated together, thereby indicating the termination of the urino-genital and intestinal passages by a single cloacal outlet—an arrangement also found in birds and reptiles. Equally striking peculiarities affect the skeleton, these being more especially manifest in the presence of two clavicles nearly conjoined, and applied against the upper surface of a single fureular bone; there are also well-developed coracoid bones, which are articulated to the sternum. In addition to this there are special osseous elements, termed epicoracoids, which are connected to the sternal and fureular bones, the scapulæ being likewise attached to the breastbone. In the accompanying woodcut (fig. 93), the fureular bone or episternum presents a

Fig 93.

Sternal apparatus of the Duck-bill (*Ornithorhynchus paradoxus*).

T-shaped outline, with the lateral free ends directed towards the shoulder-blades. It conceals the clavicles, which are slender bones and not united at the mesial line. The epicoracoids are seen interposed on either side of the stem of the fureular bone, resting laterally on the thick coracoids, which latter are articulated to the episternum and manubrial bone of the sternum below and to the scapular above. Another circumstance worthy of remark is that the bones of the skull become very early consolidated; those of the face being much prolonged forwards and flattened out into the form of a beak, which is covered by a smooth, naked integument. The jaws are not furnished with teeth; but their place is supplied by numerous rows of horny dentelations, having their spinous points directed towards the throat, as obtains in the analogous buccal papillæ in the mouths of ruminants. They also exist on the tongue in the form of conical papillæ. The feet are short, particularly strong, and pentadactylous. The Monotremes have small eyes, no external ears, and very short tails. In the male Duck-bill the hind feet are armed with a perforated spur, its channel containing an excretory duct belonging to a special glandular structure placed at the back part of the thigh. This remarkable organ was formerly supposed to be a poison gland; but there is no good ground for such an opinion. Neither is it merely a weapon of offence and defence; for then we should probably not have the gland in connection with the spur, and the females would probably also be similarly armed. We

have no doubt in our own mind that it is analogous to those supernumerary organs often found in the males of the lower as well as in the higher animals. "Since then," says Professor Owen, "this apparatus forms a sexual character, it may be presumed that its function is connected with that of generation. Whether the spur be a weapon for combat among the males, or—like the *spiculum amoris* of the snail—be used to excite the female, the injected secretion being an additional stimulus; or whether the spur be mechanically useful in retaining the female during the coitus, are conjectures which must be verified or disproved by actual observation." The females are furnished with mammary glands; but there are no external teats. The manner in which the function of lactation is performed, and many other facts bearing upon the question as to how the offspring are reared, still remain to be explained.

FAMILY I.—ORNITHORHYNCHIDÆ.

This family is represented by a single species, which is readily distinguished from the members of the succeeding family by its non-fossorial, palmate feet. It is also furnished with eight horny, tooth-like formations regularly disposed, two on either side above and below. The crowns of the anterior pairs are long and thin, those of the posterior set being broader and oval. The snout is prolonged, compressed, broad, and covered by a naked coriaceous integument; the lower jaw is shorter and narrower than the upper, and marked posteriorly by transverse lines. The tongue is very peculiar; the anterior half or narrow portion being covered with coarse papillæ, whilst the posterior division is broad, slightly overlapping the former, and armed in front by two prominent horny spines. The ornithorhynchus is furnished with cheek-pouches. The fur is hairy throughout; the tail being flattened, broad, and conspicuous.

THE DUCK-BILL (*Ornithorhynchus paradoxus*), or AUSTRALIAN WATER MOLE—Plate 31, fig. 99—is a native of New South Wales and Van Diemen's Land. A full-grown individual varies in length from eighteen to twenty inches, including the tail, which measures about five inches. The fur exhibits a tawny or rufous colour, one or other of these tints prevailing in different varieties. In the young state the skin is entirely destitute of hair, and the jaws are short, soft, and flexible. In the adult the tongue is placed far back, the tip being fully an inch behind the anterior opening of the bill. According to Professor Owen, "the raised posterior lobe of the tongue must impede the passage of unmasticated food to the pharynx, and doubtless tends to direct it on each side into the cheek-pouches, whence the ornithorhynchus may transfer its store at leisure to the molar teeth, and complete its preparation for deglutition. An air-breathing, warm-blooded animal, which obtains its food by the capture of small aquatic animals while submerged, must derive great advantage from the structure which enables it to transfer them quickly to a temporary receptacle, whence they may be extracted and masticated while the animal is floating on the surface or at rest in its burrow."

The Duck-bill feeds on small molluscous animals, various aquatic larvæ, and especially on water-bugs belonging to the genus *Naucoris*, which abound in the running streams and lakes of Australia. The most interesting account of the habits of this animal yet placed on record, is that given by Mr. Bennett in the first volume of the Zoological Society's Transactions. Speaking of one which he kept in a semi-captive state, occasionally tethering it to a stake by the river's side, he tells us that "it was exceedingly lively, swam in the centre of the stream, and appeared in excellent health and spirits. The water at one part of the river being very clear, I saw its movements distinctly under the water. On diving, it sank speedily to the bottom, swam there for a short distance, and then rose again to the surface; it ranged the banks, guiding itself in its progress according to the impressions received by the mandibles, which appeared to me to be used by it as very delicate organs of touch. It seemed to feed well; for whenever it inserted its beak into the mud it evidently procured some food from thence, as, on raising the head, after withdrawing the beak, the mandibles were seen in lateral motion, as is usual when the animal masticates. Although several insects were basking and fluttering about the surface of the water, close to it, no attempt was made to capture them, either from its not seeing them, or from its preferring the food which the mud afforded. The motions of the mandibles in this animal, when seeking its food in the mud and water, are the same as those of a duck when feeding in similar situations. After feeding it would lie sometimes on the grassy bank, and at others partly in and partly out of the water, combing and cleaning its coat as usual with the claws of the hind feet. After permitting it to swim, feed, and clean itself for an hour, it was replaced, although with great reluctance on its own part, in its box; it did not, however, as before, betake itself to repose, but commenced and continued a scratching on the sides of the box." During sleep the duck-bill rolls itself up in the form of a ball. For this, and many other interesting facts, we are indebted to Mr. Bennett, who has also given us a full account of the form and extent of the burrows which these animals construct in the banks of rivers. One of these burrows measured fully twenty feet in length. It commenced in some long grass about five feet from the water's edge, passed upwards in a serpentine direction, terminating near the surface of the ground in a rounded excavation, the lower part of this hollow forming a nest of dried grass and weeds. In this particular burrow Mr. Bennett captured an unlucky ornithorynchus, which, on being drawn out by the leg, manifested the most alarming evidences of fear, its heart palpitating violently. It did not scream, or make any attempt to bite; during its subsequent captivity, however, it frequently uttered a soft growl during the night, at which time it also made vigorous efforts to escape.

FAMILY II.—TACHYGLOSSIDÆ.

The members of this family are at once distinguished from the former by the mixed spinous and hairy character of their fur, as well as by the circumstance of their possessing a slender subulate muzzle and a merely rudimentary tail. On closer examination we find that the jaws are entirely edentulous, the palate being armed with several rows of small spines directed backwards. A more significant character is founded on the form of the tongue, which is long, narrow, rounded, and very extensile—hence the family name above given—closely resembling the lingual organ in their placental representatives, namely, the true ant-eaters and pangolins. The pentadactylous feet are short and thick, the digits being furnished with powerful falciform claws adapted for burrowing. The second and third digits of the hind feet are particularly long. The stomach is simple, capacious, and spherical when distended. The cœcum is moderately developed.

THE PORCUPINE ANT-EATER (*Tachyglossus Hystrix*), or AUSTRALIAN HEDGEHOG of the colonists, is a native of New South Wales and Van Diemen's Land, but is now rather rare in the first named locality. It is maintained by some, on grounds apparently tenable, that the forms proper to the two habitations are distinct species; but others consider the differences observable insufficient to prove a separate origin. Without offering a positive decision, we strongly incline to the belief that they are different animals, the form known as the Van Diemen's Land species (*Tachyglossus setosus*)—which, however, is not peculiar to that island, according to the testimony of Mr. Waterhouse—being provided with small and narrow digits, as compared with those of *T. Hystrix*, whilst the hairy appendages of the skin are also longer, the spines, on the other hand, being relatively short. Other minor differences likewise exist. These animals are about the size of our common hedgehog, varying in length from fourteen to eighteen inches. The hairy portion of the skin exhibits a chestnut colour, the spines being whitish except at their tips, which are black. Like hedgehogs, they roll themselves up when attacked on the open ground; but their safety is usually more effectually secured by burrowing in the earth, or by entering a previously constructed tunnel. These animals feed upon ants, captured by the protrusion and subsequent retraction of their extensile glutinous tongues, after the manner previously described in our account of the typical edentate ant-eaters or myrmecophagas.

Those who desire more extended information respecting the structure and economy of the monotreme marsupials, are referred to Professor Owen's elaborate article "Monotremata," contained in the third volume of Dr. Todd's Cyclopædia of Anatomy and Physiology; and also to Mr. Gould's large folio work on the "Mammals of Australia."

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